RAILROAD GAZETTE

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Contributions

Valve Clearance and Compound Locomotives.

Baltimore, Md., Sept. 6, 1901.

To the Editor of the Railroad Gazette.

Your interesting editorial on *four-cylinder tandem locomotives* in your issue of Aug. 30 takes exception to the use of large inside clearance in the slide valves of modern compound locomotives and you intimate that a careful use of indicators would prove the mistake of this practice. It seems to me that in discussing this question you have overlooked the factor of cylinder clearance, which I have known to vary as much as 400 per cent. on different locomotives, with the same type of valve gear. It is apparent that the compression on engines with small clearance will be much higher than on engines with large clearance, and I believe that on all of the compound locomotives built in the United States to-day you will find that this compression has been most carefully considered and studied by the use of the indicator.

Where a locomotive will work its steam to the best advantage with the valves line and line on the inside, with say 6 per cent. cylinder clearance, it will readily be found that with a reduction to 3 per cent. cylinder clearance at short cut-off, the compression will run considerably over steam chest pressure, causing a loop in the indicator diagram and probably the lifting of the slide valve from its seat with a large resulting waste of steam.

What we want in the locomotive is a valve so arranged that at a minimum cutoff the steam will be compressed to about boiler pressure at the point of lead opening. There are two ways of reducing this excessive compression, one by increasing the cylinder clearance and the other by increasing the inside valve clearance, and it can but be assumed that the careful engineers in charge of designing of modern locomotives have considered this matter carefully and decided on the proper combination of clearance in the cylinder and valve to produce the greatest economy. They are so mutually dependent that one cannot be changed to advantage independent of the other.

I have known railroad mechanical men who believe that the cylinder clearance can be reduced to a minimum without detriment to the efficiency of the locomotive. Where such changes have been made to advantage it is reasonable to suppose that there was not sufficient compression before the change was made reducing the cylinder clearance.

I have made a great many indicator tests of compound locomotives and in some of them found that a valve clearance of ½ in. on each side of the low-pressure valve was absolutely necessary for a proper steam distribution. Clearance has been used successfully and with increased efficiency at *high speed on two-cylinder compound passenger engines* to the extent of ¾ in. on each side of the valve. It is reasonable to suppose that these large clearances will cause a waste of steam when the valve is in its central position. I have, however, found the loss of power at slow speed due to increasing the inside clearance practically nothing on *two-cylinder compound engines*, as the reversed compression curve on the indicator diagram will show, there being a very small rectangle cut out of the card at the extreme corners in starting. There is also a gain due to lower back pressure on *some engines*. The loss on the steam side of the piston, due to early release, does not balance these gains on compound locomotives. The effective pressure is reduced at the moment when the crank is almost on the center and the effective work, lost by the reduction of the card at this point, is inappreciable.

It is noted, also, that this reversal of curve on the compression line disappears entirely at comparatively slow speeds, say 15 miles an hour.

I am a great believer in inside valve clearance. It is more difficult to get steam out of a *high-speed locomotive cylinder* than into it. The larger this valve clearance the better, provided the cylinder clearance is such that the compression line will approach boiler pressure, at normal speed and minimum cut-off.

I have not considered the effect of valve motion on this question, as we are in this country effectually tied to the very imperfect steam distribution derived from the Stevenson link motion.

To increase the efficiency of engines in service I would strongly recommend *any Master Mechanic* reducing the cylinder clearance on his engines to a minimum and then cutting out the inside of his slide valves so as just to avoid a loop in the indicator diagram when running at normal speed and minimum cut-off. I think a great many will be surprised at the increase in efficiency of the locomotives.

In reference to the effect of this inside valve clearance on drifting, I have made a great many tests with *two-cylinder compound locomotives*, with the valve clearance varying from nothing to ½ in. on each side of the valve of the low-pressure cylinder, and have noted practically no difference in the drifting. It is only with the large cylinders of compound engines that difficulty is experienced in drifting, which is due to the large volume of air to be displaced in these cylinders. An indicator card taken while these engines are drifting will show a very sudden rise of air pressure at the end of each stroke, causing a jerk in the engine which at *high speed* amounts to a heavy pound. This trouble is now corrected by the use of by-pass valves allowing a free circulation of air from one end of the low-pressure cylinder to the other when drifting. The necessity for this valve was first demonstrated by the Richmond Locomotive Works with their Tramp Compound engine, and the first successful valves of this character were designed by the writer and since applied to all of the Richmond compounds. I note that in the Schenectady tandem, the builder refers particularly to a by-pass valve of their design for accomplishing this purpose. T. H. SYMINGTON.

[The italics are ours. Consolidation freight locomotives were the subjects of comment.—Editor.]

Baldwin-Vanderbilt Ten-Wheel Passenger Locomotive—Atchison, Topeka & Santa Fe.

The Baldwin Locomotive Works are building five 10-wheel passenger locomotives with Vanderbilt boilers for the Atchison, Topeka & Santa Fe Railway which are to be used on some part of the system within reach of the California or Texas oil fields, and they will be equipped with oil-burning apparatus. They are Vauclain compounds with 135,000 lbs. estimated weight on the drivers, and 40,000 lbs. estimated on the truck, making a total of about 175,000 lbs. for the engine in working order.

The driving wheel base is 14 ft. 6 in., the wheel base of engine 26 ft. 7 in. and the total wheel base of engine and tender 56 ft. 6½ in. The length over all for the engine is 41 ft. and the total length over all, engine and tender, 66 ft. 10½ in. The height of center of boiler above rail is 9 ft. 2 in. and the height to the top of stack is 15 ft. 4½ in. The fire-box has 135 sq. ft. of heating surface and the tubes, of which there are 360, 15 ft. long and 2 in. outside diameter, have 2,811 sq. ft., making the total heating surface 2,946 sq. ft. There are, of course, no grates; the smoke-box is 68 in. in diam. and 58 in. long, and the exhaust nozzle is from 4½ in. to 5 in. in diam., with the tip 8¾ in. below the center of the boiler.

The cylinders are 15½ and 26 x 28 in., and the driving wheels are 69 in. in diam. over tires. The engine truck wheels are 30 in. in diam. The driving axle journals are 9 x 12 in. and the engine truck axle journals are 6½ x 10½ in. The main crank pin is 6¾ x 7 in., and the main rod is 10 ft. 10½ in. long from center to center. The length of ports (circular) is 34 in., the steam ports being 1½ in. wide and the exhaust ports 4½ in. wide with bridge widths of 3 in. and 2¾ in. The greatest travel of valves is 5½ in., the outside lap is ⅞ in. on the high pressure and ¾ in. on the low pressure; there is ¼ in. inside clearance on the high-pressure valve and ⅜ in. inside clearance on the low-pressure valve, and the lead in full gear is ⅛ in.

The boiler is of the wagon top type adapted to the Vanderbilt fire-box and the working steam pressure is 200 lbs. per sq. in. The length of fire-box is 10 ft. 11 in. and the external diameter over corrugations is 63⅜ in., the thickness of the cylindrical fire-box steel being ¾ in. The fire-box is supplied with fire brick suitably arranged for the use of oil burners.

The tender has a capacity for 6,000 gals. of water and 2,200 gals. of oil. The tender trucks are Player cast steel with rigid cast-steel bolster. The truck wheels are 34¼ in. in diam. and the journals are 5 x 9 in., the diameter of wheel fit on axle 6⅜ in., the diameter of axle center 5⅜ in., and the distance between centers of journals longitudinally 6 ft. 4 in.

The special equipment includes Tower couplers at back of tender, Nathan sight-feed lubricators, Crosby safety valves, Leach sanding devices, Nathan simplex injectors, American outside equalized driver brakes and Westinghouse tender brake equipment, "Solid" brake-beams, Ross-Meehan driver brake-shoes, Jerome metallic packing for piston rods and valve stems, and the Linstrom syphon on the tender.

The International Engineering Congress.

[At various recent dates we have published considerable information about the International Engineering Congress recently held at Glasgow in connection with the exposition there. We have given the organization of the Congress and abstracts of such of the papers as seemed to us most likely to interest the readers of the *Railroad Gazette*. On page 635 was printed the presidential address of Mr. Mansergh, on page 646 Mr. Gould's paper on Compound Locomotives on the Buenos Ayres Great Southern, on page 651 an abstract of the paper describing the experimental high speed electric car of the German General Electric Co., and on page 672 Sir Guildford Molesworth's paper on the Uganda Railway and the paper on the proposed tunnel between England and Ireland. The most interesting part of Mr. Timmis' paper on Modern Practice in Railway Signaling appeared on page 650. Below will be found some notes on the Engineering Congress made by a special correspondent of the *Railroad Gazette* who was present, and which give a little additional information.]

In connection with the most successful exhibition now open in Glasgow (which has already been visited by over 7,000,000 people, and which promises to realize a surplus of about £100,000) a Congress of the different learned Societies of Great Britain was held during the first week in September, at which representatives attended from foreign Governments and Societies.

The Congress was divided into nine sections: Railways, Waterways and Maritime Works, Mechanical, Naval Architecture and Marine Engineering, Iron and Steel, Mining, Municipal, Gas and Electrical, and lasted four days, the mornings being devoted to the reading and discussion of different papers and the afternoons to visiting places of interest to the various sections. In this respect the place of the Congress was fortunate, as Glasgow abounds with works attractive to engineers of all kinds, civil, mechanical or electrical.

The President of the Congress was Mr. James Mansergh, the President of the Institute of Civil Engineers, whilst the Chairmen of the various sections included Sir Benj. Baker, Sir John Wolfe Barry, Mr. William H. Maw (President Institute of Mechanical Engineers) and the Earl of Glasgow. The members all met first in one body to hear an address from Mr. Mansergh, and then separated into the various sections. The subjects for the Railway Section were:

Jas. Barton, "The Proposed Tunnel Between Scotland and Ireland."
I. A. Timmis, "Modern Practice in Railway Signaling."
Prof. C. A. Carus-Wilson, M. A., "The Economy of Electricity as a Motive Power on Railways at Present Driven by Steam."
Capt. G. B. Macauley, R. E., "The Soudan Railway."
Sir Guildford L. Molesworth, K. C. I. E., "The Uganda Railway."
Prof. W. C. Kernot, Melbourne, "Australian Railways."
Horace Bell, "Cheaper Railway Fares."

There was not at any time a full attendance in the Railway Section, there being nothing like the interest shown in the railroad papers that there was in the Mechanical and Electrical sections. The paper of Prof. Carus-Wilson on "The Economy of Electricity as a Motive Power on Railways at Present Driven By Steam" provoked some discussion. The Professor went at length into the question, but his views in some respects were combated by Mr. Henry Riches, the Locomotive Superintendent of the Taff Vale Railway, who said that the writer of the paper had omitted to include in his figures the cost of transferring freight from electrically worked branch trains to the steam propelled cars on main line, also that whilst the traveling public would gain by having four short electrical trains instead of one steam train, yet that would mean an increase in staff to work. Mr. Riches supported the view that some more economical method of working than the present was not only necessary but possible. Having regard, however, to the large mileage of railroads laid down on present conditions, some other method of working trains, electrically, than that of obtaining the power from a third rail or an overhead conductor should be devised, and he looked forward to a self-contained apparatus whereby each vehicle would carry its own power.

Mr. Timmis' paper on "Modern Practice of Railway Signaling" created considerable interest. In addition to describing the Westinghouse Electro-Pneumatic method of working points and signals and the low-pressure system, it contained a good description of what the author called the "Crewe System" of working points and signals by electricity throughout. There was practically no discussion on the paper, as the only speakers were Sir Douglas Fox and Mr. F. W. Webb, of the London & North Western, both of whom are associated with the author, the former in the Timmis automatic signaling, and the latter in the "Crewe System."

Two papers of more than usual interest were those on two railroads built or being built for semi-political reasons. We refer to Sir Guildford Molesworth's paper on

the "Uganda Railway" and Capt. Macauley's on the "Soudan Railway." The former was interesting as showing how difficulties can be met by engineers, and the latter for the rapidity with which certain forms of lines can be constructed. Both gentlemen were well acquainted with their subjects, Capt. Macauley having been selected by the Minister of Public Works in Egypt to write the Soudan paper. Sir Guildford Molesworth was present at the discussion of this paper and remarked that when a line of this sort was being made and the public saw the rapid progress of the work, they were impatient at the apparent slow progress of other lines, overlooking the fact that in a line like the Soudan railroad which was made for political reasons, no expense was spared to get the work through as rapidly as possible; and even some public lines are rushed more than others. As, for instance, the Beluchistan railroad, 95 miles in length, was completed in a little more than two months, the last 20 miles being completed at the average rate of 3¼ miles per day. In Uganda, on the other hand, they took a year to complete 100 miles, and the maximum rate was 1¼ miles a day.

Among the papers read in the Waterways section was one written by Mr. Isham Randolph, on "Novel Plant Employed in Transporting the Excavations of the Chicago Drainage Canal Works," which was submitted in that gentleman's absence by Prof. L. F. Vernon-Harcourt, Honorary Secretary of the section. It gave a description of the appliances used in excavating and removing the materials in connection with the Chicago Drainage Canal Works. Many of them were the outcome of the stupendous requirements of the work. It was bound to exercise a wonderful influence as an educator, and embolden men to undertake enterprises more vast than were considered practicable before its success had been demonstrated. The great array of mechanism brought into being for its construction, which earned vastly more than it cost to produce, was, most of it, without a sphere of usefulness after the work was completed. As a corollary to the work already done, they were engaged in giving the Chicago River, which is the main artery of supply for the Sanitary and Ship Canal, dimensions commensurate with the new uses to which it was being put. The stream was being widened to 200 ft., with a channel depth of 26 ft. Center pier bridges were being removed, and their places supplied by modern structures of the bascule type. A member stated that the plant mentioned would cost from £250,000 to £300,000.

The Chairman, in proposing a vote of thanks to Mr. Randolph, remarked that the subject really touched how far those in charge of public works ought to go in expenditure on plant and machinery. The question was becoming extremely urgent in the older countries where the conditions of labor were becoming very acute, and, of course, they were still more acute in places like the United States, where labor was so highly remunerated. The difficulty engineers now found, in this country at any rate, in having any idea when the work in which they were in charge would be finished was very often found in the conditions of the labor market. On the other hand, every contractor must also feel that there was a point beyond which he ought not to go in supplying plant to the work he was constructing.

One of the most interesting papers in the whole Congress was that written by the Hon. Charles A. Parson and Mr. G. Gerald Stoney on "Trials of Steam Turbines for Driving Dynamos." The interest in this was due to the wonderful development of the turbine as a means of propelling ships, there having been stationed on the Clyde at Glasgow a steamer built on the turbine principle to Mr. Parsons' designs, which has been daily making some remarkable runs. This paper was read and discussed in the Mechanical section, where also the Secretary of the section, Mr. Worthington, read a paper by Mr. R. Gould, Assoc. M. I. C. E., on "Some Particulars of the Results of the Compound Locomotives on the Buenos Ayres Great Southern Railway."

In the Electrical section the most attractive paper was that by Herr O. Lasche, of Berlin, on High-Speed Railroads, which was read before a very full house.

The Railway Signaling Club.

The announcement from Secretary Tilton concerning the annual meeting of this club will be found in the proper column of this issue, and the two papers to be read are also reported. In addition to these features the members have been asked by President C. C. Rosenberg, in a circular letter which he has sent out, to discuss a number of questions which have been brought up by inquiries that have come to him during the past year. Mr. Rosenberg outlines these questions as follows:

What are the duties of a Signal Engineer? Shall he be held responsible for everything connected with installation and maintenance, viz., surveys, plans, installations, standard mechanical construction, manipulation and maintenance of signals, keep records and make comparative statements of cost; or should he simply make a survey and plans for installing new work or renewals, and have a general supervision of the work, the work to be done by contract or under the charge of the division officials? And should the division engineer, having charge of the signals, through his supervisor or inspector, become responsible for the proper maintenance, ordinary repairs, inspection, unnecessary failure of signals to operate or for false indication given to trains through neglect of apparatus or carelessness on the part of his signal organization? If so, to what extent should he consult the Signal Engineer?

When can an interlocking plant be economically operated with power? At what number of levers (mechanical) would it be economy to substitute power? (Assume that the interlocking is at grade crossing, junction or inlet or outlet of yard; also that power would have to be provided). Would the extra expense incurred by such installation be overcome by a saving of labor to operate? How does the cost of maintenance compare with a mechanical plant? How much quicker, if any, can movements be made with a power plant, than in one operated manually? Are the chances any greater for giving false indications? What would be a fair number of levers (mechanical plant) for one man to operate in connection with handling the telegraph business at a junction? (Assume two shifts of 12 hours each; three wires; 1,200 to 1,500 lever movements in 24 hours). How many lever movements would be considered a day's work for one man; (a) eight hours (b) 12 hours?

The Selection of a Steam Boiler.*

BY W. E. SNYDER, M. E.

The series of physical and chemical tests prescribed by the U. S. Government for marine boilers is a good guide as to the quality of the material and strength of tubes; the size and distribution of stay bolts and braces and the manner of their connection; the kind of tubes and their proper expansion in the tube sheet or header. As regards the kind of tube, Mr. Seaton, in *The Engineer* of June 29, 1900, says solid drawn steel is better than lap-welded iron and much better than lap-welded steel, while a series of tests made by the British Naval Architects and reported in *Zeitschrift des Vereins Deutscher Ingenieure* of June 23, 1900, show that tubes made from steel containing from 20 per cent. to 25 per cent. nickel are much superior to the common iron or steel tubes.

The design of the joints demands special attention. One point which deserves particular mention is the thickness of the plate as specified, compared with its actual thickness. The plates are sometimes rolled much thinner on the edge than the nominal thickness, owing to the wear and spring of the rolls. The vice-president of one of the principal boiler insurance companies gave the writer data which he had obtained by actual measurement of plates, and which showed from 10 per cent. to 30 per cent. less on the edge than the nominal thickness of the plate. A joint made with the worst of the above plates would have only 70 per cent. of the effective metal which the designer intended it should have. On most of the plates, however, the reduction of the edges will not be so great as this, but the best way to get the proper thickness is to insert in the specifications, after the nominal thickness, the words "measured on its thinnest edge." This will prevent any possible misunderstanding.

In water tube boilers the tube caps and bolts and nuts by which they are fastened deserve attention. The stripping of the threads or breaking of these bolts has cost more than one man his life. In water tube boilers the sweeping effect of circulation manifests itself in very curious ways. In some horizontal water tube boilers the mud and sediment will be swept up into the back ends of the upper rows of tubes, often closing them completely while the hottest part of the boiler will be comparatively clean. In other cases this dirt will deposit in the nipples connecting the back headers with the drums, thus restricting circulation, which in turn causes overheating of the upper rows of tubes with serious results in consequence. The writer has seen in ordinary two-flue and return tubular boilers deposits of loose scale and sediment directly over the bridge wall, varying in quantity from a peck to two or three bushels, while the remainder of the surface would be practically clean. The circulation in this case would be sweeping the entire boiler with the exception of directly over the hottest part of the fire, where the current would be directly upward, while the scale would be deposited in a heap, its presence frequently not being suspected until a large bag appeared in the shell.

In considering the importance of the circulation both for promoting evaporation and for preserving the heating surface it would seem essential that this particular feature be one for special investigation in choosing a boiler. The boiler ought to be of such design that circulation is free and unrestricted. Unfortunately this is a special defect in some common water tube boilers. The connections between the generating tubes in which most of the evaporation takes place, and the drums in which the liberating occurs, are so restricted in area that the circulation is throttled and the tubes become overheated and blistered very easily. This trouble is far more prevalent in some cases than in others. If the furnace is directly under the front ends of the tubes, so that the hot flame from the fire impinges directly against the tubes, or if forced blast be used or blast furnace gas—which sometimes produces the sharp effect of forced blast—the conditions are especially favorable to blistered tubes due to restricted circulation.

Another matter which merits discussion when considering the boiler as a steam generator, is that of moisture in the steam. No particular type may be designated as one which makes wet steam, though many practical men assert the contrary. Conditions of operation and not features of design produce wet steam. In some 1,200 tests of the quality of steam made by different types of boilers, the writer has found in nearly all cases the steam commercially dry or containing less than 2 per cent. moisture. This will usually be found in practice, though some boilers run as high as between 2 per cent. and 3 per cent. The writer has seen trials of boilers in which over 8 per cent. moisture in the steam was reported, and has then tested these same boilers and found less than ½ of 1 per cent. moisture present. This tends to verify the statement made above that excessive moisture is due rather to some condition of practice than design of boiler. There is no other explanation of such an abnormally high percentage of water present unless we conclude that the engineer reporting such results was incompetent.

To illustrate the cumulative saving of a good boiler plant as compared to a poor one when they are run side by side for a number of years, suppose we make the following assumptions:

Suppose a plant of 7,000 h.p. capacity, good boilers and furnaces, properly designed and erected, be operated an average of 275 days a year for 20 years; the coal consumption being 4 lbs. per boiler horse-power hour, and the cost of the coal $1.50 per net ton, delivered at the boilers. Now suppose a plant of equal capacity, but of such poor type, wrong proportions and bad designs, that 5 lbs. of coal are burned per boiler horse-power hour, for the same period of time and that the coal costs the same per ton. The value of the fuel wasted by the poorer boiler plant in the 20 years is $693,000—a sum sufficient to command the respect of the average business man, even at the present time.

The poorer boiler plant might be installed for about $100,000, while the better one might cost about $130,000. Now, suppose an expert engineer had had charge of the installation of the better plant and had received $10,000 for his services. What does the total difference in first cost amount to when compared to total saving effected? There is simply no comparison, as the difference in first cost would be saved in little more than a year. In addition, in the poorer plant, cost for cleaning and repairs would be greater, as well as for the removal of the greater amount of waste from the furnaces.

The figures given are in round numbers and the conditions are assumed, but neither is by any means the result of guesswork. The writer has tested, and has in mind, plants where more than 5 lbs. of coal per boiler h.p. hr. were burned, as well as plants where less than 4 lbs. per boiler h.p. hr. were burned. While the boiler plant may not run 275 days every year for 20 years, yet its lifetime will certainly be equivalent to that running time, and the total amount wasted would be the same. 7,000 h.p. is not an especially large plant. Many plants are much larger, and the waste will be in proportion to the size of plant as well as to time of operation. So that there are really no unusual conditions in the above comparison, which serves as some illustration of what the aggregate waste from a boiler plant may mean when considered for a number of years.

*Extracts from a paper presented before the Engineers' Society of Western Pennsylvania, June 18, 1901.

Brooks Ten-Wheel Passenger Locomotives for the New Zealand Government Railways.

The accompanying illustrations show a 10-wheel passenger locomotive delivered by the Brooks Works of the American Locomotive Company to the New Zealand Government Railways in August. The gage is 3 ft. 6 in. and the fuel to be used is bituminous coal. The weight on drivers is 64,500 lbs., the weight on engine trucks 27,000 lbs., making the total weight of engine in working order 91,500 lbs., and the tender loaded weighs 57,000 lbs. The cylinders are 16 x 22 in., the steam ports are 17⅞ in. long and 1¾ in. wide and the least area of exhaust ports is 25 sq. in. with a bridge width of 2¾ in. The valves are of the improved piston type, the greatest travel being 4¼ in. with inside admission and 1 in. steam lap, exhaust edge line and line, and the lead in full gear $^1/_{16}$ in.

The driving wheels are 50 in. in diam. over tires and the centers are cast steel. The truck wheels are 30 in. in diam. The driving axle journals are 6½ x 8 in. with enlarged wheel fit and the truck axle journals are 4½ x 8 in. The main crank pins are 5 in. in diam. x 4½ in. long, and the main side rod pin is 5½ in. in diam. x 3¾ in. long with 5¾ in. in diam. at the wheel fit. The heating surface, general dimensions, and some other information will be found in the following table:

General Dimensions:

Wheel base, engine	18 ft. 3 in
Wheel base, driving	10 ft
Height, center of boiler above rails	6 ft. 8½ in
Heating surface fire-box	91 sq. ft
Heating surface tubes	1,260 sq. ft
Heating surface, total	1,351 sq. ft
Grate area	16.7 sq. ft

Boiler:

Boiler	Improved Belpaire wagon top
Boiler, work steam pressure	200 lbs
Boiler, material in barrel	Steel
Boiler, thickness of material in shell	½, 9-16 and 7-16 in
Boiler, thickness of tube sheet	½ in
Boiler, diameter of barrel front	51 in
Boiler, diameter of barrel at throat	55½ in
Boiler, diameter at back head	51 in
Seams, kind of horizontal	Quadruple butt and quadruple lap
Seams, kind of circumferential	Double
Crown sheet stayed with	Direct stays
Dome diameter	22 in

Fire-box:	
Fire-box	Sloping
Fire-box, length	84 in
Fire-box, width	29½ in
Fire-box, depth front	66 in
Fire-box, depth rear	43 in
Fire-box, material	Steel
Fire-box, thickness of sheets,	Crown ⅜ in., tube ½ in., side and back 5-16 in
Fire-box, brick arch	Self-supporting
Fire-box, mud ring width	Back 3 in., sides 2½ in., front 3½ in
Fire-box, water space at ton,	Back 4 in., sides 4 in., front 3½ in
Tubes, Number of	220
Tubes, material	Steel
Tubes, outside diameter	1¾ in
Tubes, thickness	No. 13 B. W. G.
Tubes, length over tube sheet	12 ft. 7 1-16 in
Other parts:	
Exhaust nozzle	Single and permanent
Exhaust nozzle, diameter	3¾ in. and 4 in
Exhaust nozzle, distance of tip below center of boiler	1 in
Tender:	
Type	8 wheeled steel frame
Capacity for water	2,100 gallons
Capacity for coal	5 tons
Under-frame	13 in. steel channel
Diameter of wheels	30 in
Diameter and length of journals	3½x6 in
Special equipment:	
Brakes	Westinghouse, English manfacture, B. W. equalized on back of all drivers.
Sight feed lubricator	Detroit
Safety valves	Ashton
Injectors	Sellers
Springs	A. French Spring Co.
Metallic packing	United States & Brooks Works

The Short Line-San Pedro Situation.

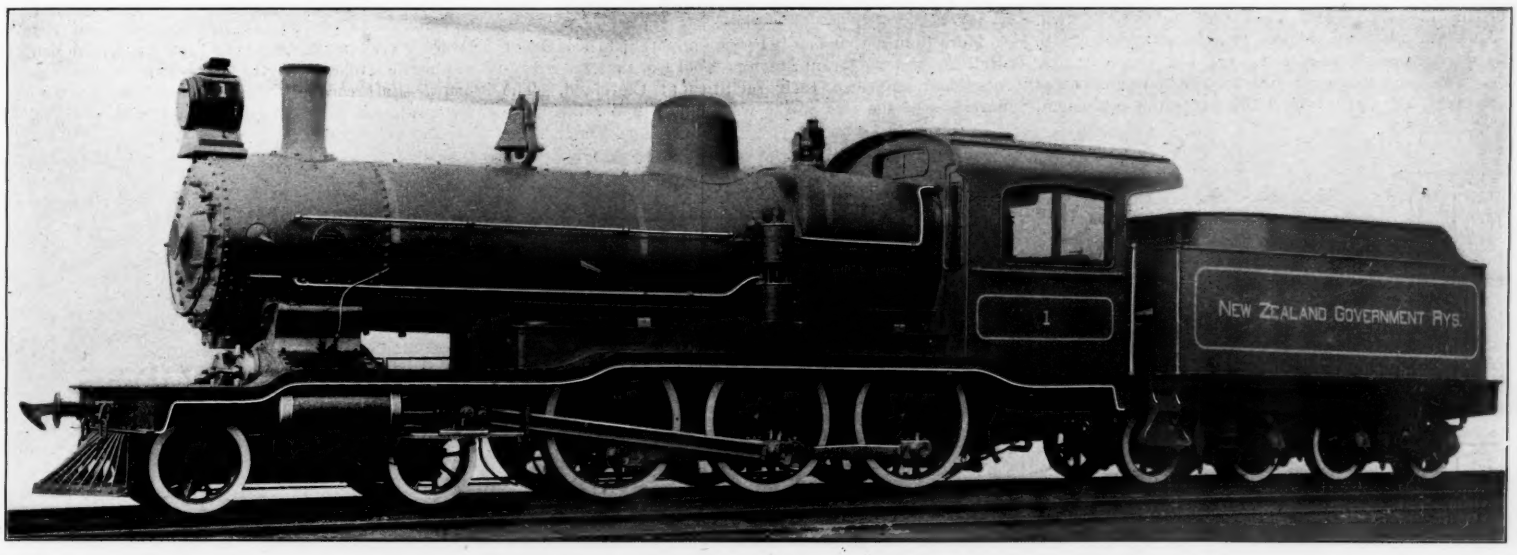
A short history of the struggle for the line from Salt Lake to Los Angeles and San Diego was given in the *Railroad Gazette*, Sept. 13, p. 637. In the United States Circuit Court, at Carson City, in August, 1901, Judge Hawley presiding, C. O. Whittemore for cross-complainant, the San Pedro, Los Angeles & Salt Lake Railroad Co., against the Utah, Nevada & California (Oregon Short Line) Railroad Co., applied for a restraining order or writ of injunction preliminary to the final hearing. The order was granted and the case was fixed for hearing on Sept. 19, 1901. This meant that the San Pedro had claimed the whole of the Short Line grade through Lincoln County, Nev., as shown by the original survey of 1889. The San Pedro, to make its claim good, had built small stretches of grade along the route.

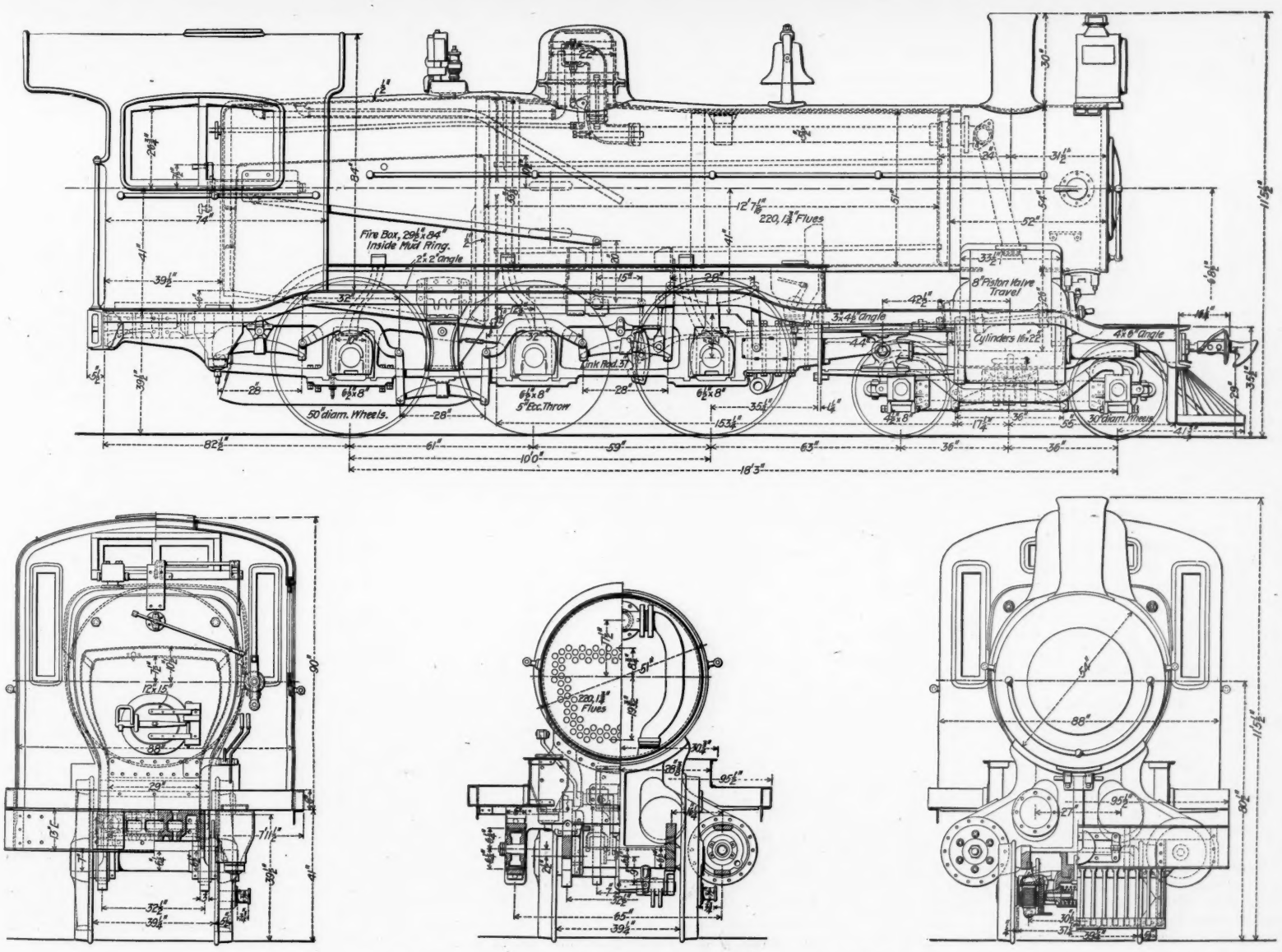
As long as the injunction lasts the Short Line cannot go ahead with its work, and the San Pedro is unable to let any large contracts. So the result is a general cessation of work in Nevada until the matter is settled.

On Sept. 17, at Salt Lake City, Utah, testimony was taken by T. Tracy Smith as to the survey made across Nevada by the Short Line. The San Pedro was represented by Vice-President and General Counsel T. E. Gibbon, of Los Angeles, and by General Attorney C. E. Whittemore; the Short Line by General Counsel Williams of that road, and Judge W. R. Kelly, of Omaha, General Solicitor of the Union Pacific. It was decided that on account of the loss of so many papers by the Short Line in a fire a short time ago to have testimony taken and to postpone the trial.

In 1899 the Short Line filed at the Land Office at Carson City, Nev., maps and surveys of the entire grade now in dispute; the San Pedro now claims that the maps did not represent a survey; and that no actual survey had been made since that made by Barlow in 1889 and 1890. The San Pedro will try to show that the maps that were delivered were but a copy of the old survey. Testimony taken bore directly on this point.

Benjamin Sanders, an attorney and notary public of Pioche, testified that on April 26 a man by the name of Windsor arrived with a map; that J. Q. Barlow, the leader of the surveying party, took an oath as to the correctness of the map, and that he administered the oath. He was questioned closely as to the





Brooks Ten-Wheel Passenger Locomotive—New Zealand Government Railways.

mail facilities, the object being to prove that it would be impossible to have a genuine map made in the time since the beginning of the survey. G. H. Berlin testified that he was one of the party from Uvada to Pioche, and from that point to Calientes. The first day the work was regular and a mile or a mile and a half was covered; stakes were put every 100 ft. Second day work was the same. The third day word came that the work must be finished to Panacca that day. R. A. Young, of Salt Lake, worked with the party as rodman from Calientes to the California State Line. He told of going around a slough 300 yds. wide and resuming the line on the other side; of calculating the distances by the stakes of the old survey and not by measurements; of the whole party riding 12 miles in one day.

J. Q. Barlow, chief of surveying party, in direct testimony, said that he surveyed the contested line in 1889-90, and that he re-traced the line with a party last April and May, carrying the regular surveying instruments and using the old field maps and notes. He opened up the work and built 75 per cent. of the existing grade of 75 miles to Uvada, when he was called to Ogden. This was in June, 1890, and by the time he left the grade to Calientes and a portion of that running to Pioche had also been made. In the fall of 1889 witness started a survey, and it was run through to California under his supervision, and stakes set 100 ft. apart; maps were made in the field, and also profiles were drawn. On April of this year witness said he was directed to make a resurvey to re-identify the old Union Pacific grade. The corps under his direction, he testified, started out on April 22, 1901, with a full surveying equipment, including transit, chains and several thousand stakes, together with maps and field notes of the old original survey.

On cross-examination it appeared that each sectional map, 10 or more in all, bore the affidavit of J. Q. Barlow, made in the desert last April and May, in which he swore that he was the person employed to make the survey by the Utah, Nevada & California Railroad Company (Oregon Short Line), that the survey of this company's line of railroad described in the map and notes was made by him as surveyor from his measurements and notes.

J. B. Berry, Chief Engineer of the Union Pacific and Consulting Engineer for the Short Line, was called. Concerning the identification and relocation of the survey now in dispute, he said that no record of the stakes was kept in any survey and that it was not essential to put stakes at any certain distance apart. He thought that Mr. Barlow had done enough work last April to thoroughly establish the reliability of the 13 maps which were under discussion.

J. C. Beye, a civil engineer, testified that he had been over the line after Mr. Barlow had made his survey; that he had found old and new stakes, and that the line coincided with the old survey, and that enough stakes were there to guide a construction gang. C.

Water Scoop for Passenger Locomotives—Great Eastern Railway.

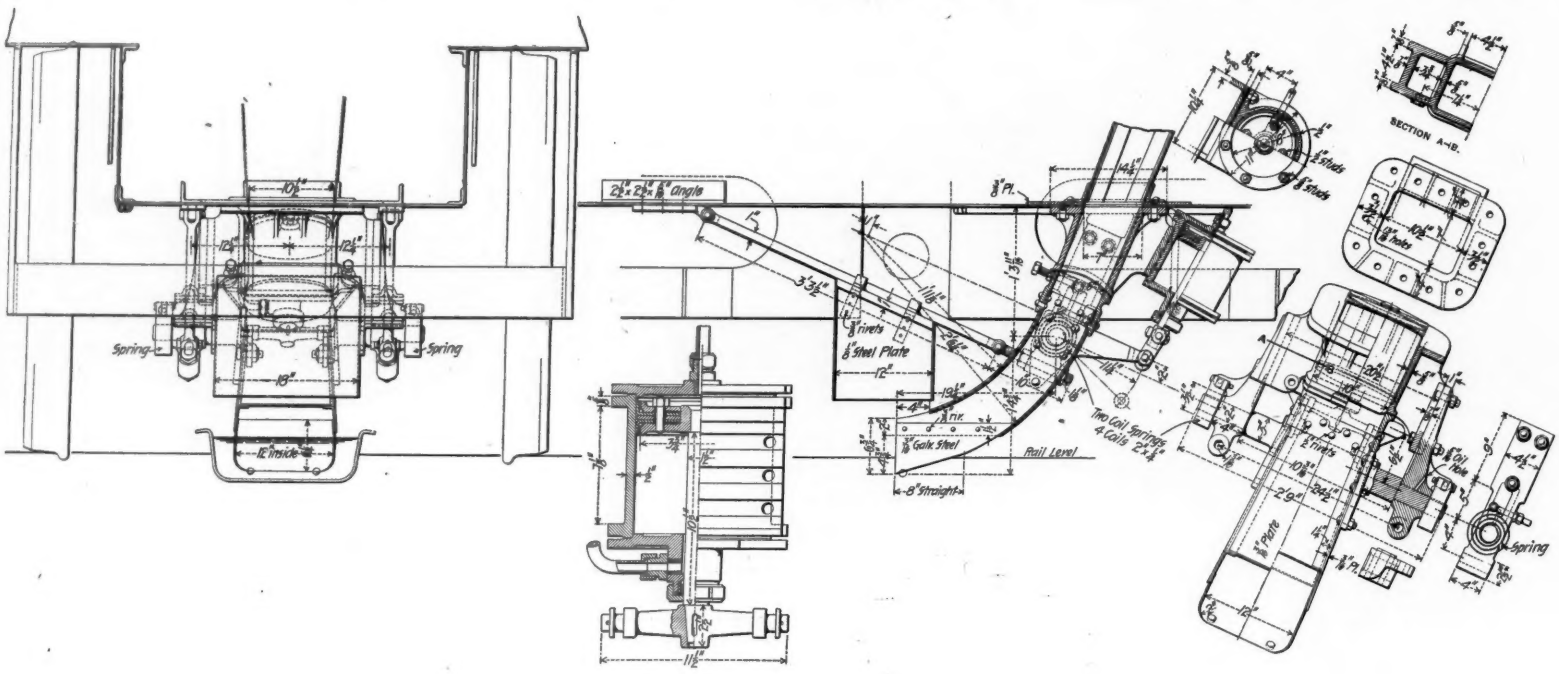
The track trough and water scoop for locomotives (invented nearly 40 years ago by Mr. Ramsbottom, of the London & North Western) have never been used in England so much as in this country. The Lancashire & Yorkshire has used the water scoop about 10 years, but until quite recently there has been no considerable use of it elsewhere except on the London & North Western. The North Eastern, the Great Western and the Great Eastern have lately begun to use it.

One advantage of taking water without stopping on fast runs is mentioned by Mr. Rous-Marten, who states conditions on the London & North Western as follows: "The tenders used on the West Coast Anglo-Scottish expresses weigh 25 tons on the London & North Western from London to Carlisle, and 45 tons on the Caledonian thence."

The accompanying illustrations show a water scoop used on the main line express passenger locomotives of the Great Eastern Railway. The design is by Mr. James Holden, Locomotive Superintendent, to whom we are indebted for the drawings, in which the general construction and a sufficient amount of detail are shown. The scoop is air-operated through the cylinder and levers shown, the action in taking water being accomplished by a push-up movement of the piston. There are air admission pipes at top and bottom of the cylinder and flat coil springs in tension on the ends of the trunnion bar. The controlling valve in the engine cab gives the desired action in raising or lowering the end of the scoop by compressed air and the coil springs insure its remaining lifted clear of the track when air pressure is cut off, as in normal running or when the engine is housed. An interesting feature is the hooding of the intake end of the scoop, to restrict the splashing of water. The form and attachments of this hood are apparent from the illustrations.

The New Grant Tool Works at Franklin, Pa.

More than a year ago it became apparent to the Grant Ball Co. and the Grant Machine Tool Co. that their business had outgrown their facilities at Cleveland. The interests of the two works were united under the name of the Grant Tool Co., the capital stock was increased to $800,000, a site for new works was selected at Franklin, Pa., and the following business organization was made: General Charles Miller, President; Mr. J. J. Grant, Vice-President and General Manager; Mr. O. D. Bleakley, Treasurer, and Mr. A. R. Davis, Secretary. The board of directors further includes Messrs. J. S. Coffin, H. Lamberton, W. J. Bleakley, J. W. Rowland and R. H. Grant.



Water Scoop for Express Locomotives—Great Eastern Railway.

The new plant is shown in general plan in the accompanying illustration as completed and proposed; it occupies a large part of two blocks. The general contract for building the plant was given to the Osborn Engineering Co., Cleveland, and after about a year of preparation shop work was begun in August of this year. The formal opening was deferred until Tuesday, Oct. 1.

General Miller, apparently believing that a closer acquaintance could do no harm between "the man behind the gun" and the men who on occasion may do so much toward making the gun, invited Governor W. A. Stone, of Pennsylvania, to be present with his staff and many other military men of the State. The invitation was generally accepted. Lunch was served in the pattern shop after an inspection of the works. In the evening there was a formal reception to Governor Stone at the Nursery Club.

The plant has main offices 35 x 53 ft., a machine shop 100 x 250 ft., a ball factory 80 x 125 ft., a pattern shop 30 x 100 ft., a blacksmith shop 40 x 50 ft., and engine and boiler rooms, each of which is 40 x 40 ft. There will be built on the south side of Orchard street a machine shop of the same dimensions as those of the present shop, and the ball factory will be extended 80 x 80 ft. There will also be a foundry built where indicated on the plan. At present castings for the Grant works are made in the foundries of the Franklin Air Compressor Co., near by.

The office building is of buff-colored brick, two stories. The offices are on the first floor and drafting rooms are above. All other brickwork about the plant is red, and the construction is a combination of brick and standard rolled steel shapes, with liberal lighting. The shop offices are in the east end of the machine shop and are built clear of the shop floor on girders that bridge the end of the clear span of the shop. This and features of the brick and steel work are illustrated herewith.

The machine shop has a clear span of 46 ft. 8 in. from center to center of main columns, and bays 25 ft. 10 in. deep, center to center of uprights, run the full length of the shop. The main floor is of cement concrete 6 in. thick, and the main area is served by a 20-ton pneumatic traveling crane made by the Northern Engineering Co., Detroit, Mich. The brick work of the side walls extends only 3 ft. 6 in. above the cement floor level and above that all is glass and steel, including the clear-story. The apportionment of windows is illustrated in a part side elevation and sectional views.

There are two tool rooms, one in each bay at about the mid-length of the shop. An annunciator button on the shifting-rod of each machine calls a messenger from the tool room to receive, grind and return tools to the machines. A spur of the Franklin branch of the Erie railroad runs well into the main shop, and the several classes of machine tools are grouped in the four corners of the shop, the northeast quarter and the main floor being used for erecting work. The time of employees is kept by Rochester time recorders.

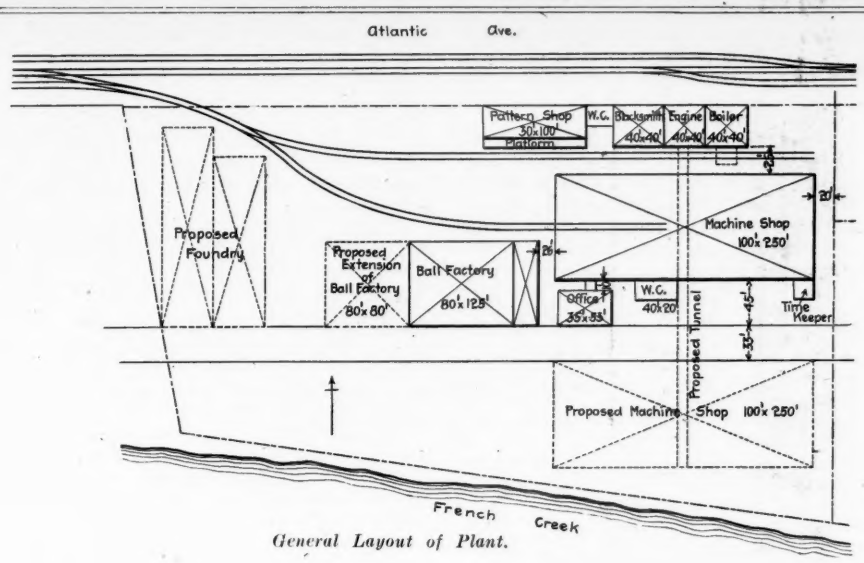
The two boilers are of 150 h.-p. each, of Erie City Iron Works make, and are fired by forced draft and automatic stokers of the American Stoker Co., New York. Soft coal is dumped directly from cars of the Erie railroad into the boiler room, and a Jeffrey Mfg. Co.'s conveyor takes ashes up to the cars on the ground level. The basement under the engine room contains, besides these boilers, a B. F. Sturtevant heating and ventilating plant with fans 7 ft. in diameter, driven by a small independent engine; two Smith-Vaile feed pumps and a feed-water heater, and a Franklin air compressor that supplies air for the pneumatic crane and shop tools. There is a separate pump that supplies drinking water from a mineral well. The exhaust from the main engine is used for heating feed water.

The engine room contains an 18 x 42 in., 250-h.p. engine, built by C. H. Brown & Co., Fitchburg, Mass.; a 76-h. p. Ball engine for electric lighting; a Thomson & Houston belted Class SS-16 generator, and a well-arranged marble switchboard controlling the lighting circuits of the whole plant and having a Cutler automatic cut-out. There is also being installed an electric system by which the main engine can be stopped by pressing a button in several places about the works.

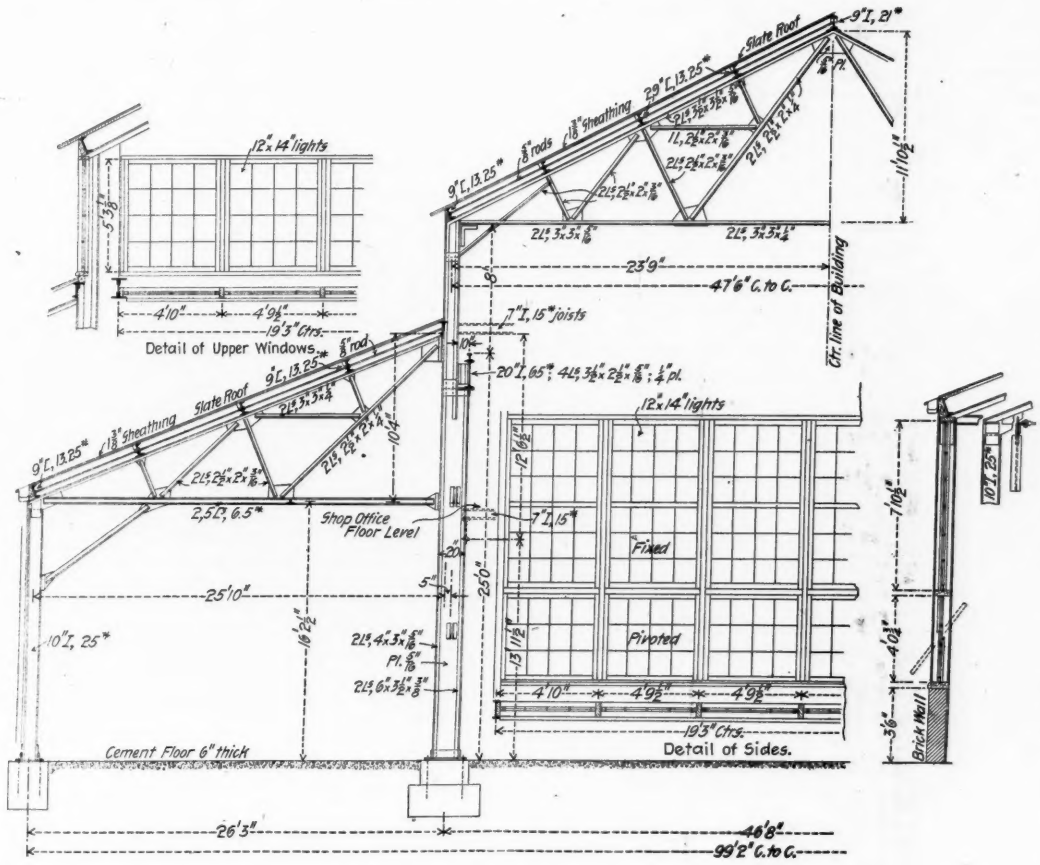
There is a tunnel connecting the basement of the engine room and the machine shop. In it are the air ducts, electrical conduits and the rope-drive for the machine and ball shop shafting. The rope-drive was put in by the Geo. V. Cresson Co., Philadelphia, and has eight main strands from the engine wheel to the machine shop and three strands driving the line shaft for the pattern and blacksmith shops. The arrangement for the machine shop is shown in cross section and the tunnel and rope-drive are shown in plan.

The ball shop is thoroughly equipped with automatic machinery, and with oil-fired case-hardening furnaces. Balls of brass, bronze, german silver and steel are made in sizes ranging from 1-16 in. to 8 in. diameter. The grinding, polishing and gaging departments are all well organized and the final process of inspection and storage is completed in a part of the ball shop that is built to two stories at the end nearest the main offices. Attention has been given to the comfort of employees in providing a light and well supplied wash room, with separate bowls and lockers.

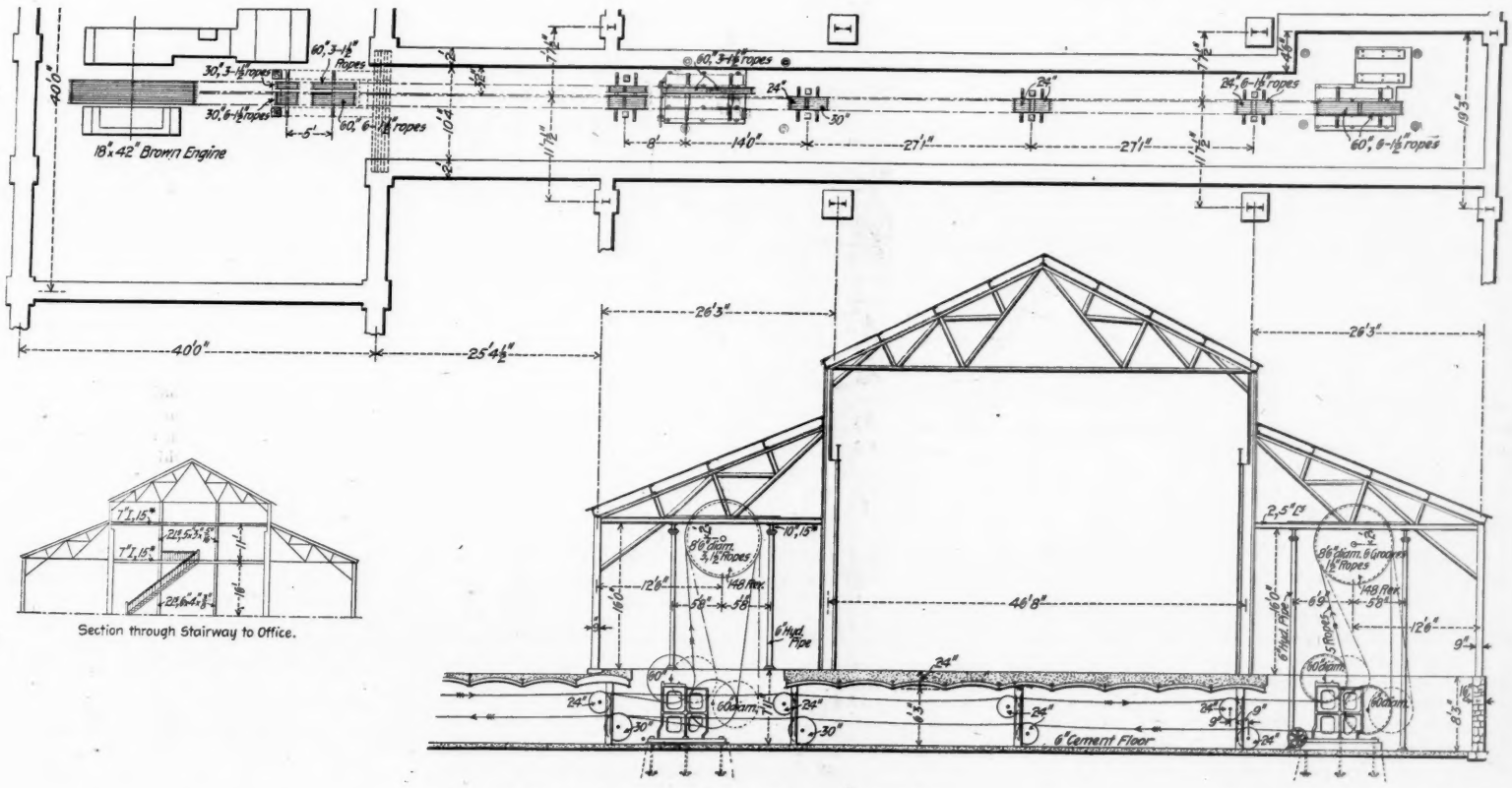
The principal product of the Grant Tool Co.'s new



General Layout of Plant.



Details of Machine Shop Structure.



Plan and Cross-Sectional Views of Rope-Drive.

The New Plant of the Grant Tool Company at Franklin, Pa.

plant will be lathes, boring mills, drilling, milling and worm-wheel cutting machines, besides a wide range of work for railroad and other shops. The ball shop is also a very important feature of the plant, and large orders for balls and other small fittings have recently been received.

Locomotive Coal Statistics.

At the April meeting of the Rocky Mountain Railway Club there was a short discussion of a paper by Mr. Parker on "Railroad Statistics," which had been presented at an earlier meeting. Extracts follow:

Mr. A. D. Parker (General Auditor, Colorado & Southern).—As far as the fuel on the Colorado & Southern is concerned, a division of it is made between passenger and freight, according to the use of the locomotive. We take the actual performance of the locomotive. When it is used in passenger service the fuel is charged to that account, and when it is used in freight it is charged to the freight account. There is a good deal of shrinkage of coal, and considerable loss other than what is burned in the fire-box. If we only charge against a certain locomotive the fuel that it consumes, nobody will be charged for the shrinkage and light weight and the loss. If the loss is charged against the Superintendent of Motive Power he is going to get after the engineer, and the engineer is going to get after the man who delivers the coal to him, and the leakage is found out and stopped, and if a man wants to make a good record he has to look after the fuel that he gets in the bins, and we are then able to find out whether there is a shrinkage at the bins, whether or not there is any pilfering, and whether the coal is consumed or lost.

Mr. Humphrey (S. M. P., Colorado & Southern).—I am pleased to have the discussion of this paper go over. There has been no paper before this Club that is of the importance of this one. Some roads that I know of charge the oil that they issue to locomotives to lubrication; others will issue oil for repairs, if the engine is just out of the shops after being repaired. On one line the showing of oil will be excellent, although the other one may really have made a better showing. It is necessary to secure reliable facts and statistics, and I believe the statistics should be carried further than they are carried now, and that an account should be opened with every employee, to allow him to stand on his own record. In regard to cost of lubrication and fuel, the costs for repairs, etc., should be shown on each engineer's record, so that he could compare his work alongside of his fellow engineers. I took two engineers who were running passenger trains. They both had engines as near alike as they are possible to be made; they both came from the works at the same time; they had both been recently repaired, and it cost one engineer for the year, on account of repairs, oil and waste, and the fuel of his engine $3,300 more than it did the other man. When this statement was shown to the engineer he said there is something wrong, there is a leakage some place. If Bill has a better record than I have, I suppose he deserves it, but I will see that he don't have it next year. The next year there was a saving of $2,000 in favor of this man.

Chairman Quereau.—There are one or two points that I beg to differ with the writer on, that money should be compared with the product of money, and that every-

thing should be based on the ton-mile regardless of the weight of the load that is carried. On the engine-mile basis a 15 x 20 engine gets just as much credit as a 22 x 28, but the comparison between the two is as the comparison between the two cylinders, so that I say the old basis will not cover the point, simply because it is limited to the mile instead of the product of the weight by the distance it is hauled.

It occurs to me that Mr. Parker is a little inconsistent. On page 25 you will see he says: "The average tons behind the locomotive and the hauling capacity will lead to an investigation of fuel consumed per ton mile." I think this is a very important point.

It occurs to me that there should be different classes of statistics for the General Manager, the General Superintendent, and the Superintendent of Machinery. I do not exactly mean that they should all be based on the ton-mile. The General Manager is interested in the statistics of both the General Superintendent and the Superintendent of Machinery; he knows what the General Superintendent is doing, and what the Superintendent of Machinery is doing, and is able to compare the work on a financial basis. The General Superintendent is interested in statistics from an operative standpoint, and the Superintendent of Machinery from the basis of a motive power department standpoint. The General Superintendent is interested in noting the proportion of dead weight to live weight, and whether the locomotives are hauling their rated tonnage, and the General Manager would not judge the Superintendent of Machinery from an operative standpoint at all. Therefore, I think different statistics should be made for the different departments. I think that the ton-mileage of the locomotive should be included in the ton-mileage statistics, and be added to the tonnage of the train behind it, as it takes as much coal, in fact more, to haul a ton of locomotive than it does to haul a ton of car.

Cheaper Railroad Fares.*

The question is one mainly of third class fares, for it is from this source that quite 90 per cent. of passenger receipts are derived. The second class must be regarded as a moribund institution, while the first class is on most lines unremunerative, and is maintained, in great measure, as a politic concession to a small but influential body of customers.

The absence of systematic and detailed statistics for the railroads in the United Kingdom in a large degree accounts for the timidity, or we may call it conservatism of their management. There are probably but few of our railway managers who are in a position to unhesitatingly quote the prime cost of moving a passenger or a ton of goods, as derived from the operations of any single year, or could do more than guess at the cost of running expenses per train mile. Yet, if we turn to the statistics annually offered for the American railroads, or, better still, for the Indian railroads, we find that for each system, under separate administration, there is an invaluable review of its yearly operations, in every detail, and for each department, and in a form so clear as to render the results on any one line readily comparable with those of another. It is due in great measure to these statistics that the rates and fares on Indian railroads are probably the lowest in the world, and at the same time eminently profitable.

Taking as an instance the East Indian Railway, the figures for 1899 show that in this year the line carried a total of 18½ million passengers, of which 17 millions were of the third or lowest class; that the average number of passengers in a train of all classes was 228; the average distance traveled was 61 miles; the cost of hauling one passenger one mile was one-eighteenth of a penny, and the fare charged one-fifth of a penny per mile—all debits included. Now, it may be readily allowed, in comparing the fixed charges (for operation only), and the running charges on this line, with those of some of our leading English lines, that the East Indian has some points in its favor; but these, after all, are as nothing in face of the fact that if the average income of the third-class passenger in England is taken, say, at £15 a month, that of the same class in India may be taken, and liberally, at no more than 15 shillings; that is to say, that in order to induce any passenger traffic at all, and one that was worth considering, the Indian railroads have had to come down to rates which the English railroad manager would have imagined impossible. They have found, however, that by moving very large numbers at very low fares, the result is most profitable, and, in face of such figures as are given above, it is but reasonable to ask whether the penny a mile must be continued as the standard fare in the United Kingdom, *i. e.*, for ordinary journeys. The reply might be that the penny pays, and that any materially lower fare may not. Yet against this we have the fact that fares approximating to a halfpenny a mile, or indeed less, on the Central London, the District Railway, and the Glasgow Tramways, are, with large numbers, not only possible in a fiscal sense, but that, in the face of keen competition, it is the only way of getting the traffic. From such facts it seems fair to expect that if the halfpenny a mile was adopted generally on English railroads, for all journeys, instead of the penny, that thousands, or rather millions, would largely increase the number of their railroad journeys, and that, moreover, an entirely new stratum of travelers would be reached. It is further to be remembered that a development of passenger traffic is now well understood to bring with it a corresponding improvement in goods traffic.

The area on which the experiment would seem at first most likely to prove successful is on the railroads serving the seaboard round London. There lies a field for the enterprising manager such as exists nowhere else in the world—a city of, let us say, five millions of sea-loving people at one end, and the sea at the other. With fares reduced to a halfpenny a mile, with a fast direct service, and with ordinarily decent carriages, thousands upon thousands of people, who now perhaps go down to the sea once in the year, would come to regard such a trip with but little more hesitation than those who now fill the Pullman cars to Brighton and elsewhere. At a halfpenny rate, and with an ample service of quick through trains, the present passenger traffic could probably be quadrupled, more especially if facilities for through booking were arranged with the District Railway; indeed, it is more than likely that it would pay to make entirely new direct lines, electric possibly, for no other purpose than to serve a through passenger traffic between London and the seacoast. But for the railroads round London, at least, the halfpenny fare need not be confined to seaside traffic. It would effect a great development of suburban traffic, more especially on the shorter distances, and induce a far greater movement of the rural population to and from towns and villages from distances of 50 to 60 miles from the metropolis, a movement which is now inconsiderable, and which would well repay better attention on the part of railroad men.

One acknowledged difficulty in carrying out a general and considerable reduction in third-class fares lies in the want of sufficient yard and platform accommodation at many of the older principal stations, and especially in London, if, as is almost certain, the halfpenny per mile fare led to trebling the number of travelers in the third class. At many of the smaller stations, as, for instance, on the Brighton and the South Eastern and Chatham lines, the same difficulty would be experienced, though this difficulty is after all almost entirely one of money, and is one that can be met gradually and tentatively as the demand develops. A similar but probably less immediate obstacle will be found in the need for a large increase in the rolling stock. But neither these nor other difficulties would stand in the way for long when experiment had satisfactorily established that the reduction of fares would be profitable.

*Abstract of Paper by Horace Bell, M. Inst. C. E., read at the International Engineering Congress (Glasgow), 1901.

Steel Coal Storage Pockets.

BY H. G. TYRRELL, C. E.

In recent years the handling of coal in large quantities has led to a new form of construction in coal pockets. Where they were formerly built of heavy timber that would decay and wear out in a few years they are now framed largely of steel and in many cases lined with steel plates. The newly constructed plant of the New England Gas & Coke Co., Everett, Mass., contains four of these steel coal pockets having a capacity of 2,000 tons each, and one pocket with a capacity of 6,000 tons. There has also been a number of others constructed in New England, among which are those for the Boston & Albany Railroad Co., at Worcester, Mass., another for the Clafflin Co., at Springfield, and one for the Thompson-Pierce Co., of Cambridge. Another large pocket designed by the writer has recently been built for the Dominion Coal Co., at Montreal, Canada. A brief description of some of these pockets may be interesting to American engineers.

The 2,000-ton coal pocket for the New England Gas & Coke Co., is 35 ft. wide, 80 ft. long, and 72 ft. high at the sides to the eaves. As may be seen in the accompanying illustrations, coal is conveyed to these pockets by means of cable cars running on steel trestle work, which enter the pocket through dormer windows in the roof. There are four of these pockets conveniently located so as to furnish coal to the adjoining ovens. The pockets are plank lined and covered with a galvanized iron roof. The total weight of steel in one pocket is 510,000 lbs. This is equivalent to 255 lbs. of steel for every ton of coal stored.

A 6,000-ton pocket, located at the water edge, receives its coal directly from vessels in the Mystic River. It is provided with four hoisting towers, also built of steel, which travel up and down the length of the pockets, suiting their position to the hatchway of the vessel. This pocket has a width of 28 ft. 6 in., and is 432 ft. long. The pocket proper stands on a frame work of beams and columns leaving a clear headway of 14 ft. underneath for the passage of cars. The general details of this pocket are illustrated herewith. It is lined on the inside with plank, held in position by 12-in. I-beam studs 4 ft. apart. The sloping hopper sides are formed of plank and timber. Roof trusses with a 3-in. pitch are placed 12 ft. apart, and carry the channel iron purlins. The covering is corrugated iron, and the hopper gates are very simple and efficient.

The following table gives the total quantities of material used in the construction of this pocket:

Steel frame	942,000 lbs.
100 hoppers	39,000 lbs.
100 hopper gates	17,000 lbs.
Corrugated iron	14,500 sq. ft.
Spruce lumber	17,300 ft. B. M.

The total weight of steel in this pocket corresponds to 166 lbs. for every ton of coal stored. This is equal to 3½ lbs. of steel for every cubic foot of contents. The roof is provided with small hoppers about 12 ft. apart through which the coal is discharged from the hoisting towers, and the pocket discharges coal into cars running on the three tracks underneath. These tracks are connected with the inclined trestle work so as to convey the coal to the four oven pockets.

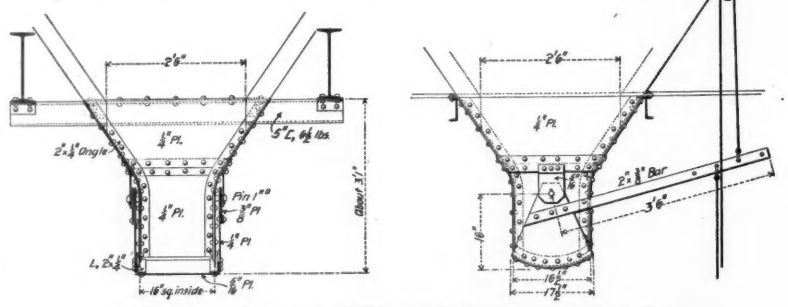
The 4,000-ton pocket designed by the writer for the Dominion Coal Co., of Montreal, is 28 ft. 8 in. wide, 16 ft. 6 in. high, and 400 ft. long. Like the last pocket described it stands up on a frame work of beams and columns, leaving a clear headway of 14 ft. underneath for the passage of cars. In designing this pocket the writer used the following figures:

Weight of coal	50 lbs. per cu. ft.
Wind pressure	30 lbs. per sq. ft.
Total roof load	40 lbs. per sq. ft.
Steel in tension	15,000 lbs. per sq. in.
Steel in compression	12,000 lbs. per sq. in.
Fiber stress in beams	16,000 lbs. per sq. in.

The pocket is divided into 33 panels of 12 ft. 1½ in. each. It is lined throughout with oak plank. The total weight of steel, including both the pocket and the platform of beams and columns on which the pocket stands, is 666,000 lbs. This is equivalent to 166 lbs. of steel for every ton of coal stored.

Another designed for the same pocket with ¼-in. plate lining instead of plank contained 983,000 lbs. of steel, equal to 245 lbs. for every ton of coal. These figures do not include in either case the rails on which the hoisting towers travel, amounting to about 16,000 lbs. The above weights of steel correspond to from 3 to 4 lbs. per cu. ft. of contents.

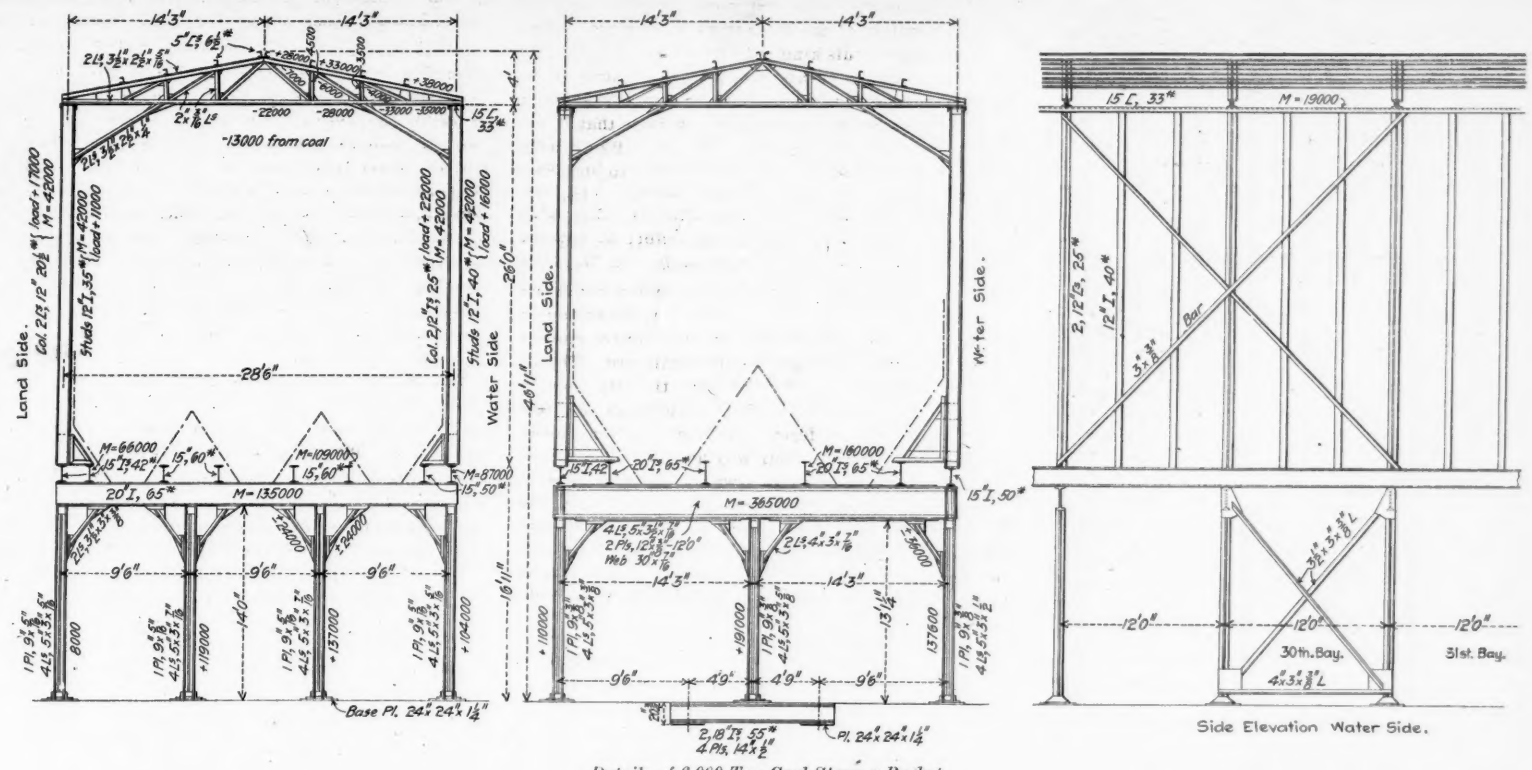
It may be noted in passing that the weight of steel in storage pockets varies almost directly according to the number of tons stored, and is, for plank-lined pockets, from 160 to 170 lbs. per ton of contents to 240 to 250 lbs. per ton of contents where the pockets are lined with steel. If, for example, the pockets be designed for the storage of some heavier material such as ore, it will still be found that the above figures hold true. The writer recently designed a large bin for the storage of gold ore for Johannesburg, in South Africa. In this case the ore was assumed to weigh 100 lbs. per cu. ft. and while the weight of steel corresponded to 7 lbs. per cu. ft. of the bin, it still retained the ratio given above, 170 lbs. of steel for every ton of ore. It will be seen that these figures give a very ready and convenient means of estimating approximately the quantity of material in this kind of structure.



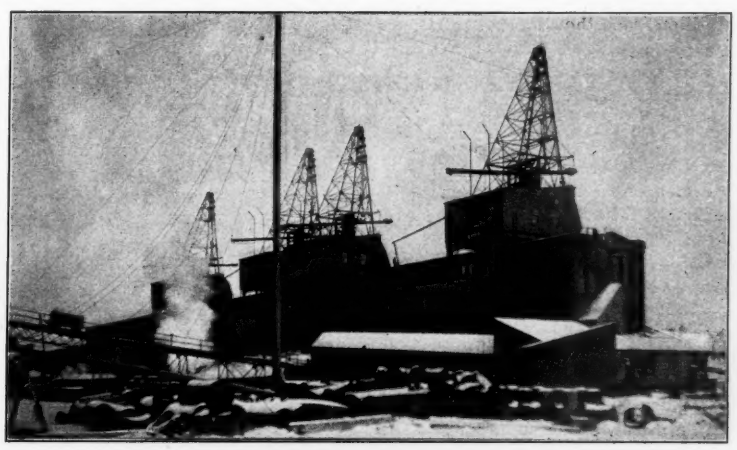
Details of Hopper for 6,000-Ton Coal Bin—N. E. G. & C. Co.

The coal pocket built for the Boston & Albany Railroad, at Worcester, Mass., is somewhat similar in construction to those already described. In this case, however, the coal is brought to the pocket by trains instead of by water. At one end of the pocket there is a sloping trestle work, up which the coal cars are drawn to the roof of the pocket, and there emptied through sliding hoppers in the plank roof. The loaded cars of coal are delivered on the siding near the pocket and are taken, by means of a cable pusher, up the inclined trestle. This pusher is operated from an engine plant as shown in the accompanying illustration. The pocket is lined throughout with 3-in. yellow pine and has a plank roof carried on steel stringers. The side studs are placed 4 ft. apart and the main panels are 16 ft. each. These and other details are illustrated.

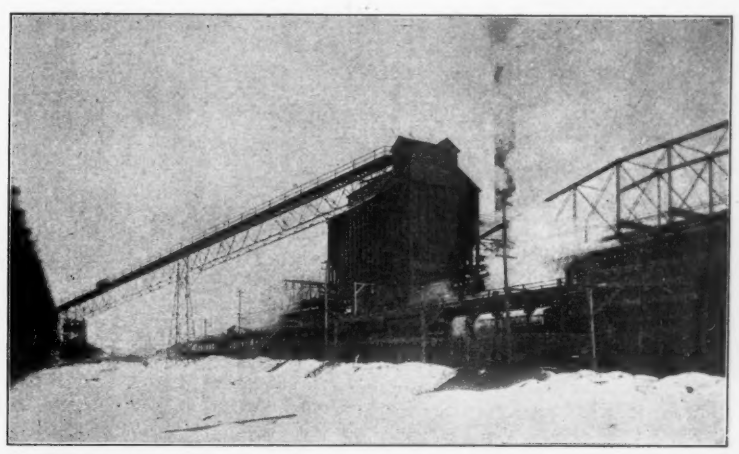
The four pockets for the New England Gas & Coke Company were built by the Riter & Conley Company, of Pittsburgh, and the 6,000-ton pocket for the same company was built by the Boston Bridge Works. That for the Dominion Coal Co., at Montreal, was built by the Dominion Bridge Company, of Montreal, Canada. The above designs were all either made or revised by the writer, while acting in the capacity of contractor's engineer.



Details of 6,000-Ton Coal Storage Pocket.

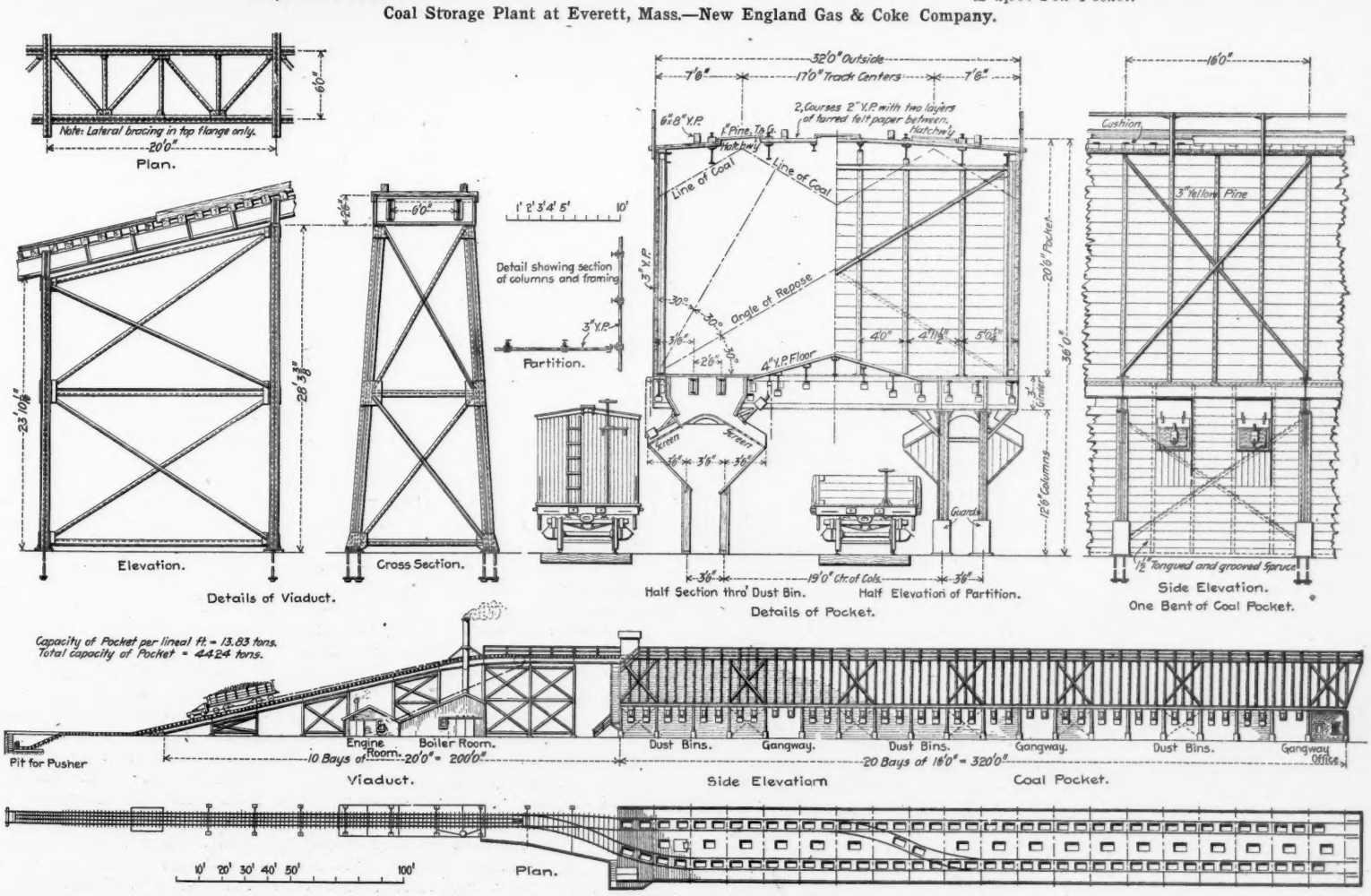


A 6,000-Ton Pocket.



A 2,000-Ton Pocket.

Coal Storage Plant at Everett, Mass.—New England Gas & Coke Company.



Coal Storage Pockets at Worcester, Mass.—Boston & Albany Railroad.

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At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Last week we published a review by Mr. F. F. Gaines, of the different systems of compounding locomotives in the United States, giving a statement of the advantages and disadvantages of the several types of compound locomotives. Finally, it was suggested that some difficulties could be got over with a three-cylinder or a four-cylinder compound engine with crank axles. "In short, remove the frills from the De Glehn compound and incorporate in the design American simplicity and strength." A locomotive, such as Mr. Gaines has briefly described, is now building at the Baldwin Works for the Plant System. It is a four-cylinder compound, 10-wheel engine for passenger or fast freight service and will have the Vanderbilt boiler and tender. The cylinders will be compounded in accord with Mr. S. M. Vauclain's latest patents for a four-cylinder crank-axle locomotive with one valve controlling the high and low pressure cylinders on each side of the locomotive, while the respective pistons of each pair of cylinders move in opposite directions. The high pressure pistons are inside connected to the cranks in the first axle and the low pressure pistons are outside connected to the second driving axle. The cylinder power will be equivalent to that of 19x28 in. simple cylinders. In the *Railroad Gazette*, Sept. 28, 1900, pages 629 to 631, were illustrations and descriptions of many French four-cylinder compound locomotives, among them the De Glehn type, and on page 638 of the same issue is some editorial comment on the subject, and to that little need be added at this moment. There is much to commend in this balanced type of compound, and a review of the subject with the references we have given will have special interest now that the main principle of so many of the French designs is to be practically tested in the United States. Mr. Vauclain has given long study to this relatively simple design, and Mr. Symons, who has ordered the first engine of this type for the Plant System, is a man of experience. It is, therefore, reasonable to expect a thorough and reliable test of this engine, and at the proper time we shall describe the engine and give the results of the test.

We wish to commend the laudable purpose of the officials of the city of Massillon, Ohio, who, in their efforts to make the city a pleasant place to live in, have adopted an ordinance which says: "It shall be unlawful for any person or persons to blow or cause to be blown any steam whistle on a locomotive, engine or machine, in a loud, shrill or piercing manner within the corporate limits." The penalty is a fine of not less than $10 or imprisonment in the city prison for thirty days or both. We may say in parenthesis that if the word "machine" includes stationary engines, as it undoubtedly does, the ordinance could be used to good purpose in the heart of New York city and in many of its suburbs, where factories blow their whistles morning, noon and night, just as would be done at a village in the mountains of Virginia. There is an example of this kind within a stone's throw of the city hall. Railroads are not the only promoters of barbarism in cities. But while we like the spirit of the Massillon ordinance we cannot believe that it will do a particle of good; at any rate, it is likely to do as much harm as good; for in the effort to enforce a law which depends upon getting hair-splitting evidence, the police and the courts often become indifferent and neglect to make proper effort to enforce other laws which are more reasonable. In fact, the occasion of the local newspaper discussion which has brought this subject to notice now is a disagreement between the city officials and the locomotive runners as to just what the legal requirements are. The enginemen fall back on the fact that the city requires them by law to do a good deal of whistling, and they refuse to see the difference between a given volume of sound delivered in their way and the same volume delivered in the aldermen's way. The only suitable authority to enforce locomotive whistling regulations is the railroad superintendent. A properly conducted campaign directed toward him should do much more good than a dozen pages of ordinances which can be enforced only by means of a mass of lawyers' technicalities.

If we may judge by the constant succession of newspaper accounts here and there throughout the thickly settled parts of the country, there are a good many superintendents who will not rein their enginemen up to a reasonable regard for the feelings of quiet people unless they are subjected to a campaign, either by a city administration or by some other body which is able to put forth considerable energy. We judge that there are not nearly so many such thoughtless railroad officers now as there were a few years ago; but there is still room for improvement at many places. The most striking fact observable in connection with whistling is, on the one hand, the complete absence of it in some localities (mostly in large cities) and the apparently perfect ease with which the requirement of silence is complied with; and, on the other hand, the entire freedom with which at other places noisy enginemen rend the air at the slightest provocation, and the meekness with which aggrieved residents put up with a constant disturbance. As a large portion of the community seem to be satisfied to swear about the superintendent instead of swearing at him, and as those who do make complaints go about the job in such an intermittent and ill-judged way, the superintendent himself is really the person who ought to take the initiative. The division officer who actually does improve his service in this respect may rest assured that he will in time receive credit for it—in heaven if not here. As in the case of doing away with dirt or other things that offend the improvement may not be much commended at first for the improved condition is really the normal condition, and so does not seem to call for comment; but president, directors and thoughtful passengers will pass correct judgment sooner or later. And to every superintendent who energetically sets out to bring his train service up to the very highest standard, the Massillon idea brings the suggestion that the whistle-nuisance problem has two branches (1), abolish whistling wherever possible, and (2), use softer whistles or have gentler hands on the loud whistles, wherever entire abolition is unattainable. The main idea to be kept in mind (aside from the efficiency of the train service) is that a hundred people in a country village are as fully entitled to quiet days and nights, if they desire them, as a hundred thousand in a large city.

The Railroads of the United States in 1900.

The appearance of the statistics gathered in Poor's Manual each year is always an interesting event. The facts collected and the method of treatment are so different from those of the statistical report of the Interstate Commerce Commission that one set of statistics can hardly take the place of the other, although the yearly appearance of Poor's cannot now have the interest that it had before the Interstate Commerce Commission began collecting and publishing railroad statistics. The latest general statistics of the Commission to June 30, 1900, appeared late in August; Poor's to Dec. 31, 1900, now appear.

The total length of railroad in the United States completed to Dec. 31, 1900, was 194,321 miles. The total reporting more or less complete statistics is 192,162 miles. The statistics giving results of operation are from 191,511 miles. The Interstate Commerce Commission's figures to June 30 are 193,436 miles owned and 192,556 miles reporting operations.

The latest statistics of the railroads of the world which we have are those for the year 1899, compiled by the *Archiv für Eisenbahnwesn*, and printed in the *Railroad Gazette* May 31, 1901. There we see that at the end of 1899 the railroads of the world amounted to 479,900 miles of road. The increase in the year may be guessed at as 2 per cent., giving the probable total miles at the end of 1900 as 490,000. It will be seen, therefore, that the United States, with 194,321 miles, had, at that date 39 per cent. of all the railroads of the world. The miles of railroad on the Continent of Europe and including also the railroads of the United Kingdom of Great Britain and Ireland at the end of 1900 probably amounted to 176,000 miles, and thus we see that the United States had 18,000 more miles of railroad than all the European countries together. It will be observed that these figures are partly estimated.

The figures of money invested and earned and of traffic carried are, of course, stupendous. The total liabilities of 192,162 miles amounted to 12,862 million dollars; or, deducting the "profit and loss" item of 93½ million dollars, the debt is 12,769 million, or about $66,500 a mile. In these liabilities the capital stock figures for 5,804 millions and the funded debt for 5,759 millions. Poor makes the debt per mile (stock, bonds and "unfunded debt") $61,884; the Interstate Commerce figures for stock and funded debt are $61,246.

The roads which report statistics of operations, namely, 191,511 miles, carried 1,071 million tons of freight and the ton-miles amounted to 141,162 million. As our readers must all know by this time (surely we have said it often enough) the British railroads never report ton-miles; they do, however, report tons. All the railroads of the United Kingdom in the year 1900 carried 425 million tons on 21,855 miles of road—that is to say, the tons carried in England averaged 19,400 tons per mile of road worked and on the United States 5,600 per mile of road. Of course, the work done can only be adequately measured by the ton-miles, which for the whole United States amounted to 737,000 per mile of road worked. This figure is an interesting one to keep in mind for occasional comparison with the traffic density of individual roads.

The passengers carried in the United States numbered 584,696,000, or 3,050 per mile of road. In the same year the railroads of the United Kingdom carried 1,142 million passengers, being 52,000 per mile worked. And this leaves out of account the season ticket holders who must have made many million journeys. This immense difference in the density of traffic of the two countries is one of the elements which make comparisons of methods of operating so misleading unless due weight is given to these various elements. The passenger miles in the United States amounted to 16,313 million.

The total traffic revenue on 191,862 miles of road (reports were received of earnings from 351 more miles than reported traffic statistics) amounted to $1,501,695,000 and the net earnings amounted to $483,248,000. The interest payments on funded debt amounted to $214,000,000 and the dividends to $119,000,000. We do not find the exact amount of the capital stock of the 192,862 miles of road reporting earnings, the figure given above being for 192,162 miles of road; but Poor calculates that the dividend payments amounted to 2.42 per cent. on the total stock. We do not find this figure worked out in the Interstate Commerce report; but there it appears that 54.3 per cent. of the railroad stock paid no dividends, and the average on 45.7 per cent. of the total stock was at the rate of 5.23 per cent.

The total locomotives reported at the end of 1900 numbered 38,065 and the total revenue cars numbered 1,385,253, of which 1,350,258 were in freight service. This latter figure agrees pretty well with the Commission's figure, namely, 1,365,531 freight cars.

Poor reports railroad built in the United States in the year 1900 as 4,157 miles. The reports of the *Railroad Gazette* for the same year were 4,894 miles. The net increase in mileage was 3,503 miles, and it is explained that the difference between railroad built and actual increase of road worked may be accounted for by mileage abandoned, or changed to side track and other mileage equipped to work by electricity. The aggregate of these items is given as 654 miles.

The tables of train-miles, traffic movement, earnings per mile of road worked, etc., are interesting, but we shall not stop now to consider them at any length. Taking up the passenger traffic, we find that the average passenger rate per mile in the year was 2.031 cents, which is somewhat more than in any year since 1896, when it was 2.032 cents. In 1888, which happens to be the most remote year given in this table, the passenger rate was 2.246 cents. In that year (1888) the passenger earnings per mile of railroad amounted to $1,729 and in 1900 to $1,730. It is remarkable in inspecting this table to see how steady

the passenger earnings per mile have been for the 13 years covered. In 1897 they had dropped to $1,399 per mile, which was the lowest point reached. The freight rate per ton per mile was 7.46 mills, which was 0.2 mill higher than in the year before; otherwise, it was the lowest recorded. In 1888 the freight rate was 9.77 mills and the freight earnings per mile of road $4,398. This figure was a fair average for 12 years, but in 1900 there was a jump of $546 per mile, namely, to $5,498.

Annual Reports.

Atchison, Topeka & Santa Fe.—This company has made great gains in revenues each year since the present company took over the property after the reorganization in 1895. But the revenue growth of the past year went beyond anything ever before reported by the company and reached figures which, for the period, were excelled only by the Pennsylvania system and a few other lines. Gross earnings increased by $8,243,000, or over 18 per cent., to a total of $54,475,000 for the 12 months to June 30 last. Freight and passenger receipts both gained heavily to secure this record, the increase in freight receipts being $5,323,000, or nearly 16 per cent., while passenger earnings gained by $2,343,400, or 24 per cent.

About 57 per cent. of the additional revenue was absorbed in operating expenses and of this expansion in working charges 55 per cent. is in turn attributable to higher cost of transportation; $2,573,000 out of the increase of $4,741,400 is expenses. These deductions left $3,500,000 to be added to net earnings, which were sufficient to pay all charges, the full 5 per cent. preferred dividend, and show a balance of $6,766,000 on the $102,000,000 outstanding common stock. These shares in the year received a first dividend of 1½ per cent. Details of the income account for three years follow:

	1901.	1900.	1899.
Average miles	7,807	7,342	7,033
Gross earnings	$54,474,823	$46,232,079	$40,513,499
Operating expenses	32,262,945	27,521,500	27,606,682
Net earnings	$22,211,878	$18,710,579	$12,906,817
Per cent. expenses	59¼	59½	68⅛
Taxes and rentals	2,040,429	1,826,293	1,669,210
Net income	$20,171,449	$16,884,286	$11,237,607
Other income	332,556	266,820	249,435
Total income	$20,504,005	$17,151,106	$11,487,042
Fixed charges	8,029,476	7,411,801	7,299,044
Balance	$12,474,529	$9,739,305	$4,187,998
Pref. dividend	5,708,690	3,139,566	1,141,657
Com. div. (1½ p. c.)	1,529,333	.....	.....
Surplus	$5,236,506	$6,599,739	$3,046,341

Preferred dividends were 5 per cent. in 1901, 2¾ per cent. in 1900 and 1 per cent. in 1899. Against the surplus of $5,236,506, reported above, the directors set aside $1,000,000 for improvements, besides $900,000 directly charged against expenses during the year for the same purposes. In addition surplus was reduced by $1,139,700, to represent discount on bonds sold since the reorganization, $1,500,000 having been charged against surplus on the same account in the two previous years. The following is a consolidated statement of the business of the system for each fiscal year during the period since July 1, 1896, when the new company took over the property:

	Aver. miles.	All income.	Exp., taxes & rentals.	Surp. over charges.
1897	6,443	$30,875,729	$24,814,425	*$87,934
1898	6,936	39,396,126	30,513,553	1,836,584
1899	7,032	40,762,933	29,332,964	4,187,997
1900	7,341	46,498,899	29,414,427	9,839,304
1901	7,807	54,807,379	34,502,039	12,474,529

The ton-miles of revenue freight increased by 422 millions, or 12¼ per cent., and the passenger-miles increased by 101 millions, or 24½ per cent. Average rates were better in both classes of traffic. Ton-mile revenue increased from 9.76 mills to 1.007 cents, and the average passenger mile rate from 2.261 cents to 2.272 cents.

There was considerable uniformity in the division of tonnage classifications in the last two years. The most significant changes were in corn and live stock traffic, which each decreased, and in wheat, which was in volume considerably more than twice the tonnage of 1900. These changes are natural developments of the harvests in the last two years. An extraordinarily heavy harvest of winter wheat, which matures early along the Atchison lines, was obtained this year, while that of 1900, particularly in Kansas, was also large, 82½ million bushels against 36½ million bushels in 1899. In corn, however, the harvest this year in Kansas, where the Atchison has 2,600 miles of road, as well as in Oklahoma and Missouri, where the Atchison has 430 miles and 300 miles respectively, was practically a failure. In 1900, while the corn crop was large, in Kansas the outturn was only 164,000,000 bushels against 237⅔ million bushels in the previous year. Thus the increase in wheat, and the loss in corn, live stock, traffic, etc., in 1901 is accounted for. The poor corn crop last summer is the only apparent questionable factor in the outlook for tonnage in the current year.

Although 52 heavy locomotives were built in the last year to replace light engines destroyed, and 152 additional engines were under contract on June 30, for delivery during the seven succeeding months, further additions to equipment are imperative. Such large increases in earnings per mile as are shown by the company's reports, create an imperative demand for more cars as well as for more power. Earnings per mile in 1900 increased over earnings of 1897 by 46.83 per cent.; locomotive capacity h.p. increase by 25.8 per cent.; and car capacity (tons) increased by 9.04 per cent.

*Deficit after payment of 3 per cent. on 4 per cent. adjustment bonds.

In this condition of the equipment—its character—the fact that such heavy charges were made against expenses for retiring light engines, and through the crowding of engines to their utmost capacity by the necessities of traffic, making constant repairs necessary, the company's equipment charges continue heavy, as in previous years. In aggregate expenses the increased charges in 1901 were $900,000, following an addition of $457,000 to equipment cost in 1900. Besides such factors as have worked in the previous year to keep equipment expenses high, the company in the past year changed a number of coal-burning engines to use oil burners, liquid fuel being now available on the company's lines, both in Southern California and in Texas. In addition inferior coal had to be used on the line between Albuquerque and Barstow, Cal., a far western and so-called desert division, because of strikes in New Mexican coal mines, which forced the company to haul coal from Illinois, Kansas and Missouri. Cost of locomotive fuel, in fact, increased by over $1,000,000, or 34 per cent., and this item accounts for 40 per cent. of the expansion in transportation cost. Increased locomotive mileage had something to do with this, but average cost of coal per ton was $1.86 in 1901 and $1.68 in 1900, while cost of fuel per locomotive mile run was 10.22 cents last year, against 8.37 cents per mile in 1900.

Additions to mileage during the year included the Gulf, Beaumont & Kansas City Railway, in the timber section of Eastern Texas, and some extensions of this line under contract when the purchase was made, have been completed. Through the acquisition of this line the company is favorably situated to take advantage of the discoveries of oil fuel around Beaumont, Texas, made since the road was sold to the Atchison. Another line taken over was the Pecos Valley in New Mexico, both of these purchases having been arranged in the 1900 fiscal year.

The amounts capitalized during the year on account of these lines were $1,073,200 for the Beaumont road, and $2,675,900 for the Pecos Valley line. The cost of other short branches, chiefly in Oklahoma, brought the total charges to capital in the year for new lines up to $4,320,000. Additional charges to capital were made during the year amounting to $1,887,600 for improvements, of which grading, ballasting, side tracks, bridges and buildings and real estate absorbed $1,573,000. For new equipment $1,028,000 was charged to capital, chiefly freight cars, while the total amount charged to capitalization on all accounts, including new lines, was $7,559,300.

Illinois Central.—This company's annual report for the year to June 30 last shows gains in revenue running up to $4,288,500, or 13⅛ per cent., bringing gross receipts up to $36,900,500. This was on an average of 4,215 miles of operated road in 1901, an increase in the year of 370 miles, or 9⅜ per cent. Operating expenses were 65.7 per cent. of gross receipts, as against 65½ per cent. in the previous year; the increase in this account was $2,874,100, or 13.4 per cent., increased taxes adding $98,300 to this amount. The balance of income for the year over all charges was $6,967,660, out of which were paid 6 per cent. dividends, as against 5½ per cent. in 1900, and 5 per cent. in previous years. Dividend disbursements were further increased over 1900 by payments in the last half of 1901 being on $6,000,000 increased capital stock sold to shareholders during the year at par when the stock was selling at a premium of about 32 points in the market, so that this subscription privilege was virtually equivalent to a special dividend of about 3 per cent.

Increase in gross earnings during the year included a gain of $2,595,918, or 11⅜ per cent. in freight revenues, and of $1,150,100, or 18⅔ per cent. in passenger earnings. Per mile of road, freight receipts increased $108, or less than 2 per cent., passenger receipts gained by $132, or 8¼ per cent., while gross receipts were $8,755, or $274 per mile above last year's amounts. This is about the highest earning capacity per mile of road reported by any of the Western railroads, as will be seen by the following comparisons of gross earnings per mile for leading lines in 1901:

	Gross earn. per mile.		Gross earn. per mile.
Illinois Central	$8,755	St. Paul	$6,506
Chicago & N. Western	7,826	Rock Island	6,643
Atchison	6,977		

Gross receipts per mile have increased largely for years, despite the constant additions in almost each year since 1895 of lines which earned considerably less per mile than did the Illinois Central at the time their operation was taken over by the company. In 1901, for instance, the increase of 369 miles in operated road was mainly on account of the Peoria, Decatur & Evansville, whose gross receipts per mile in the 1900 fiscal year were but $3,527. Despite this fact, as will be noted, gross receipts rose from $8,481 in 1900 to $8,755 per mile last year. Expansion in gross and net earnings for a series of years, together with average mileage and gross earnings per mile, were as follows:

	Average miles.	Gross earnings.	Gross per mile.	Net earnings.
1901	4,215	$36,900,460	$8,755	$11,058,668
1900	3,845	32,611,967	8,481	9,742,571
1899	3,671	28,114,690	7,659	8,552,429
1898	3,775	27,317,820	7,237	8,662,350
1897	3,130	22,110,937	7,064	6,375,054
1896	3,067	22,002,842	7,174	7,040,566
1895	2,888	19,056,994	6,599	5,788,463
1894	2,888	20,657,464	7,153	6,288,048
1893	2,888	20,095,191	6,958	5,811,250
1892	2,883	19,291,760	6,692	5,221,740
1891	2,875	17,881,555	6,220	5,120,509
1890	2,875	16,452,022	5,722	5,298,603

Expansion in gross receipts, as shown above, is not only to be considered in view of the addition of lines of light earning power, as already stated, but in view of the steady decline in average rates, unbroken even in 1900 and 1901, when so many companies have been able to report higher ton-mile or passenger-mile rates, or both. Gains in gross receipts are despite high and increasingly high expenditures for maintenance, not only in the aggregate, but per mile of road in the percentage of gross earnings absorbed.

Figures bearing on maintenance charges for a series of years follow:

	Main. charges per mile.	Per cent. of gross earnings.
1901	$2,423	27.73
1900	2,402	28.35
1899	2,033	26.60
1898	1,950	27.05
1897	2,014	28.53
1896	1,868	26.06
1895	1,630	24.74

These figures are exclusive of special appropriations out of income for betterments, which have been as follows for a series of years:

1901	$2,895,400	1898	$820,000
1900	2,416,674	1897	150,000
1899	1,475,040	1896	422,500

In these six years, therefore, the Illinois Central has appropriated $8,188,614 out of surplus income for improvements, besides the heavy amounts charged directly against expenses. How Illinois Central's maintenance charges compare with two other neighboring roads will appear below, the figures covering, for each company, the 12 months to June 30:

	Illinois Central.	St. Paul.	Atchison.
Miles	4,215	6,512	7,807
Gross, per mile	$8,755	$6,506	$6,977
Maintenance of way	1,390	1,000	824
Maintenance of equipment	1,037	465	802
Betterments and new equip.	690	352	243
Total maint. and imp's	$3,017	$1,817	$1,869

Illinois Central has more double-tracked line and more side tracks than either of the other two companies, and its traffic density is greater. It was 956,000 ton-miles per mile of road in 1901, against 560,000 ton-miles per mile of road reported by the St. Paul, and 497,000 ton-miles reported by the Atchison.

Both ton-mile and passenger-mile rates of the Illinois Central are exceedingly low. Freight was carried for but 6.19 mills per ton per mile last year, as against 6.5 mills in 1900. These rates compare with 8.62 mills reported by the St. Paul in 1901, 1.007 cents by the Atchison, 8.5 mills by the North Western, and 9.9 mills by the Rock Island.

No statement of tonnage is included in Illinois Central reports, but the freight is largely coal, grain and other similar low-class tonnage. We are able to state, for instance, that the company last year moved approximately 5,000,000 tons of coal from Illinois mines, which would be about 30 per cent. of the total tons carried in the year. In addition the company has a large coal traffic from mines in Kentucky, and also hauls from mines in Alabama and Iowa.

Low passenger-mile rates are in large part accounted for by the heavy suburban business in the Chicago district, where a fine service is given for low rates. Thus passenger-mile earnings were but 1.96 cents per passenger mile in 1901, whereas few of the company's competitors report less than 2⅓ cents. These low rates largely explain the relatively light earnings per train-mile in both passenger and freight service.

So far as the transportation results are concerned, the proportion of train mileage traffic handled, etc., the company appears to make about as fair a showing as other lines, so far as may be judged merely from comparison of the actual figures reported in operating statistics without going into physical conditions, equipment, traffic, and other determining factors. Certain figures bearing on this phase of the company's operations compared with those of two other leading lines out of Chicago, whose reports for the year June 30, 1901, are recently at hand, are shown below:

	Ill. Central.	St. Paul.	Atchison.
Revenue tons	17,735,700	15,388,300	11,112,600
Revenue ton miles	*4,016,085	3,639,977	3,876,793
Passenger miles	373,919,200	341,643,600	514,037,000
Ton-miles per mile	956,200	560,000	497,000
Freight train miles	17,077,000	15,388,000	14,807,700
Passenger train miles	10,824,700	9,917,700	11,216,800
Ton-mile rate (cts.)	.0619	.0862	1.007
Pass. mile rate (cts.)	1.960	2.324	2.272
Tons per loaded car	14.44	12.9	12.6
Loaded cars per train	16.28	17.14	....
Total cars per train	22.60	23.89	....
Average train load	235	237	243
Freight train mile rev.	$1.457	$2.04	$2.44
Pass. train mile revenue	0.847	0.805	$1.00

*000 omitted.

These figures need little analysis. The average train-load is not compiled on the same basis. The Atchison does not report its trainload, but it is the only company of the three showing engine mileage. Thus freight engine mileage was 21,100,000 in 1901, against 14,808,000 freight train-miles run, so that its average engine load is a very different total from its freight train load.

Of the changes reported by the Illinois Central in traffic and train statistics it may be pointed out that with an increase of 1,715,000 tons, or 10¾ per cent., and of 590 millions, or 17¼ per cent., ton-miles, miles run by freight trains increased 1,629,000, or 10½ per cent., and the average trainload by 13½ tons, or 6 per cent. Mileage of loaded cars increased 11⅓ per cent., of empty cars 7⅓ per cent. Freight train-mile revenue was practically unchanged.

In recent years Illinois Central has done much to reduce the cost of carrying traffic, and to provide new facilities for moving the tonnage which has crowded the line, but the necessity of adding new terminals, and track room, and further equipment, seems as great as ever. During the year 89⅓ miles of additional second track

have been put in operation, and a large amount of work has been done in grading and bridging for further additions of this sort. The directors have ordered the completion of the double track from Chicago to Fulton, Ky., and the building of a second track from Jackson, Miss., southward towards New Orleans.

Outlays during the year on new second track amounted to $2,015,067, and it is estimated that during the coming year upwards of $5,000,000 will be needed for that purpose. In addition the company has 1,333 miles of side and passing tracks, or 124 miles more than in 1900.

The company now has 891 engines and 39,685 cars of all kinds. In the past year there were added to the equipment 78 engines and 5,579 cars. Notwithstanding these additions to an already large equipment there is, and has been for some time, a shortage of cars, and further large expenditures must, during the coming year, be made in cars and engines.

Part of the cost of all this work was met out of maintenance expenses, part out of betterment funds, and part out of proceeds of the issue of $6,000,000 new capital stock, bringing the outstanding issue up to $66,000,000. Total expenditures in the year for permanent improvements are set down as $11,307,590. Larger expenditures are anticipated for the current year, and the stockholders at the annual meeting are to be asked to authorize a further increase of capital by $13,200,000, which will be offered for subscription to stockholders in October at par, the shares now selling at a premium of about 45 points. The net income of the year to June 30, 1901, $6,967,659, was 10.56 per cent. upon the present share capital of $66,000,000, and 8.80 per cent. upon the $79,200,000, to which the directors recommend that it be increased.

Boston & Maine.—In the past year this company took over the Fitchburg Railroad, thereby adding 458 miles of road, earning, gross, about $8,000,000 a year, and also extending its traffic interests in through western business. As the report for the year to June 30 makes no adjustment of accounts, for the fact that the Fitchburg operations are included, comparisons are meaningless. Transportation receipts were $30,407,000, of which $12,526,000 were from passengers, and $17,881,000 from freight; income from grain elevators, investments, etc., brought the total year's receipts up to $31,375,600. Operating expenses were 68⅛ per cent. of this, but income was also charged with $748,564 for new equipment. The available balance for dividends was $1,690,413. Out of this was paid 6 per cent. on the preferred shares and 7 per cent. on the common stock, the surplus carried over being but $45,413.

The influence of the Fitchburg's low class tonnage will account for the loss in average ton-mile rates: 1.134 cents in 1901, against 1.440 cents in 1900, and 1.430 cents in 1899. The report says that "the belief that the operation of the Fitchburg Railroad as a part of the Boston & Maine system would largely increase the through freight traffic of that road is being fully realized," and to provide the needed facilties for this increased business 18 miles of second track are being built to complete the double track on the whole length of the Fitchburg's main line, from Boston to Rotterdam Junction, 212 miles. Important yards are also being doubled in capacity.

Changes in capital account included issue of $1,735,200 shares of stock, from which $3,314,385 was realized, the proceeds being used to purchase the outstanding shares of the Central Massachusetts road. There were also issued 6,795 shares of treasury stock, sold at $190 share, realizing $1,291,050, which was available for improvements, properly chargeable to capital account. A further issue of $1,000,000 debentures for improvements on leased lines is proposed by the directors, part of the proceeds being available to liquidate advances already made by Boston & Maine. Increase in bonded debt includes $5,454,000 3 per cent. bonds issued to take up the Fitchburg stock, and $2,100,000 bonded debt of that company assumed. The capitalization was also increased by $5,976,239, of which the Central Massachusetts purchase accounts for $5,542,610; elimination of grade crossings, etc., for $270,500, and purchase of Portsmouth electric branch for $55,500.

St. Louis Southwestern.—For the fiscal year to June 30 last this company's gain in gross receipts ran considerably above the average reported for the period, and the enhancement was due less to better average rates, although this factor helped the results than to increase in tonnage movement, which relatively was about as large as any reported in the annual statements so far at hand. In gross earnings the increase was $1,478,890, or 25 per cent., an amount much larger than the gain in any previous year, although this Southwestern line has had extraordinary expansion of revenues. How receipts compare for a series of years is brought out in the following table, which also shows the tonnage and average freight rates:

	Gross earnings.	Net earnings.	Ton miles.	Aver'ge ton mile revenue (mills).
1901	$7,387,170	$2,754,280	468,837,300	1.21
1900	5,908,280	1,752,211	412,395,500	1.11
1899	5,862,340	1,653,250	380,660,600	1.21
1898	5,279,330	1,106,000	358,109,700	1.16
1897	4,743,550	887,660	325,472,200	1.13

Average operated mileage in this period has changed only slightly, being 1,223 in 1897 and 1,275½ in 1901, when gross earnings were $5,792 per mile and net receipts $2,159 per mile. In 1901 freight earnings gained $1,058,000, or 23 per cent., and passenger income $386,000, or over 38 per cent. This was with an increase of 13⅔ per cent. in ton-mileage and of 38⅛ per cent. in passenger miles, the average passenger mile rate being reported at the same figure in the last two years. This development of tonnage and passenger movement was not followed by as notable success in regulating the increase in train service, as in former years, but the officers explain this, as due largely to the class of freight, the gains being largely in local business, and the additions to tonnage compelled the company to retain its cars on the home road, unloading them at junction points, and in other ways resorting to unusual means to assure an adequate car supply. Loaded car mileage increased 3,000,000, or 10 per cent., but empty car miles increased 2⅓ millions, or 19¼ per cent. The officers evidently expect a more favorable showing to be made in the operating statistics in the present year, if tonnage holds up, and the only adverse circumstance now in view is the effect of an unfavorable cotton crop outlook in the Southwestern States. The company's record in securing steady increases in operating efficiency is creditable to the operating officers, for up to the present time it has been obtained without great expenditure for new equipment or improvements. Some of the figures, showing what has been accomplished in this respect, are given below:

	Freight train miles.	Revenue train load. Tons.	Freight train mile earn'gs.
1901	2,232,700	210	$2,558
1900	1,983,970	208	2,340
1899	2,121,360	179	2,196
1898	2,187,900	164	1,908
1897	2,037,000	160	1,818

These figures, taken in connection with the growth of ton mileage and the changes in ton-mile rate, reported in the previous table, indicate that the management has met with excellent success in holding down the cost of service. This problem, however, is now being attacked on broader plans than has heretofore been possible, on account of the condition of revenues, and the low credit of the company. In 1901 the directors appropriated $1,490,000 of surplus, or twice the year's surplus income over second mortgage bond interest, which will be available for improvements and betterments.

Colorado & Southern.—A comparison of the net earnings for a series of years of this company shows how remarkably railroad revenues have improved within a brief period. The figures follow:

1901	$1,082,348	1896	$504,070
1900	906,968	1895	550,650
1898	980,292	1894	177,520
1897	782,381	1893	128,400

Note.—Year to June 30 in 1901 and 1900. Year to Dec. 31 in previous years.

These earnings are on substantially the same mileage and exclude the old Julesburg Branch operated before the reorganization but then sold to the Union Pacific.

In the past year the company made a very excellent record as regards earning power, balance of income and improvements in physical condition and progress in handling traffic movement at lower costs. Increase in gross earnings was $556,906, or 13⅛ per cent., and in net earnings was $181,887, or 16½ per cent. Surplus over all charges was $405,648, out of gross earnings in the year of $4,794,650. Dividends of 2 per cent. were paid (the rate having recently been increased to 3 per cent. per annum) and a balance of $235,650 was carried into new account. These earnings were on 1,142 miles of road, of which 762 miles is standard gage and 380 narrow gage. In addition the company controls the Fort Worth & Denver City of 454 miles by stock ownership, and has an undivided half interest in the Colorado Midland which secures to it an interest in a through route to Ogden in connection with the Rio Grande Western, which completes the route and owns the other half of the Colorado Midland. The Rio Grande Western has, however, now passed to the Denver & Rio Grande, of which the Colorado Midland is a competitor, but this transfer of control is not likely to affect the Colorado & Southern's interest in the Midland. This purchase was accomplished by the Colorado & Southern out of its cash assets.

The transportation results of the year are interesting. The capacity of the company has been taxed by the increase in revenue tons one mile from 258,943,438 last year to 308,179,270 in 1901. The train loads are reported both for train and locomotive mileage 119½ tons for the latter and 179⅛ tons per train. This is the average of standard and narrow gage line together. The revenue train loads for 1901 and 1900 in detail are as follows:

	Frt. train load. Tons.	Engine load. Tons.
Standard gage, 1901	207	150
Standard gage, 1900	175	143⅜
Narrow gage, 1901	85	45
Narrow gage, 1900	76½	40⅜
Denver-Pueblo Division, 1901	344	...
Average, all divisions, 1901—1900	179⅛	152½

A word may be added as to the form of this report. It is small, only 27 small pages, but it contains practically all the information regarding revenue, and its sources; financial condition and operating statistics, which is necessary to understand the company's workings. It contains many statistics rare in annual reports. Earnings and expenses are given per mile of road; traffic density is reported; locomotive loads as well as freight train loads; also the number of engines per train; the weight of every engine is given, and the material account is itemized. Another table shows tonnage originating on the line and received from connections, and the revenue received from each class of freight, as well as the actual tonnage.

NEW PUBLICATIONS.

Transactions of the American Institute of Mining Engineers. Vol. XXX. February, 1900, to September, 1900, inclusive. New York: Published by the Institute. 1901.

The third volume of the Transactions of the Institute of Mining Engineers is a corpulent book of 1,158 pages, with, of course, an excellent index, as is always the case with the publications of the Institute. The frontispiece is a photograph of a portrait bust of Prof. Egleston, which is to be placed in the Memorial Hall of Columbia University as the gift of the students. The papers and discussions cover the usual range and some of them have already been brought before the attention of our readers.

Garden Truck; Rates of Transportation and Notes on the Industry. Bulletin No. 21, Department of Agriculture, Washington.

This is a pamphlet of 86 pages by E. G. Ward, Jr., and E. S. Holmes, Jr., of the Division of Statistics of the Agricultural Department, giving a large amount of interesting information concerning the fruit and vegetable industries (1) of the regions around Boston, New York and Philadelphia; (2) of the regions in the Southern States, whence shipments are made to northern markets; (3) of the lower Mississippi Valley, and (4) of the California fruit districts. The accounts of the origin and development of market gardening in the several regions mentioned appear to have been made up with care and intelligence and the tables of railroad and steamship rates are full and clear.

TRADE CATALOGUES.

Drawing Presses and Spinning Lathes.—The E. W. Bliss Co., Adams and Plymouth streets, Brooklyn, N. Y., send a new catalogue showing drawing presses and spinning lathes. These are shown in large variety by good engravings, and the essential particulars are given.

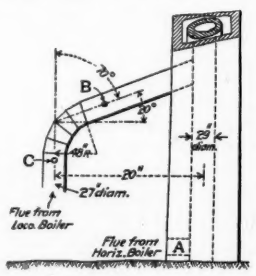
Roofing.—The Standard Paint Co., of 100 William street, New York, has issued a small pamphlet which describes concisely the waterproof, the fire-resisting, and the enduring qualities of Ruberoid roofing and the proper method of applying it on roofs of many kinds. It is a good example of trade cataloguing, giving much information without wasting words.

Pneumatic Tools.—The Standard Pneumatic Tool Co., Marquette Building, Chicago, give much useful information about compressed-air tools, in their Catalogue F, 1901. There are illustrations of almost every kind of small tool operation in railroad, marine, and ordinary industrial work. Part 1 is given to drills and various drilling conditions with "Little Giant" tools. Part 2 has to do with wood-boring in ship yards and car shops. Part 3 considers hammers, chipping, riveting, caulking and stone-cutting. Part 4 covers an interesting miscellaneous application of tools, and includes heavy riveting machines for tanks and boilers; staybolt cutters, and staybolt breakers. The details of the "Little Giant" tools are also shown in half-tone groups where all parts are numbered and catalogued.

Smoke Flues for Stationary Boilers.

BY WILLIAM WALLACE CHRISTIE.

A very necessary expense, and one which has very little special thought given it, is the flue which connects the boiler with the chimney or blower. The flue should be made air-tight and covered with insulating material, so the escaping gases will retain their heat while passing to the chimney. The cross-section of the flue is best designed when its area is equal to or greater than the combined area of fire-tubes. Where bends must occur they should be made of as large radius as possible, and have 25 per cent. greater area when the curve equals 90 degrees. A 90 degree bend or L should be avoided if possible. Friction of gases in flues having bends or curves is a matter about which little is known or recorded. The writer has made some tests, one of which is recorded with Fig. 1.



Brick chimney 70 ft. high.

Damper C closed, A open, draft .3 at B.

Damper C open, A open, draft .25 at B. A loss of 16 2-3 per cent. when both boilers are in use.

The effect produced by the 48 in.-radius bend on the draft is to make it 10 per cent. less at C than at B.

These results were obtained from a number of trials.

Fig. 1.

The top of the flue should rise from the boiler to the chimney, giving a liberal grade. Sometimes circumstances prevent this, as in the Hudson Building, Fig. 2, where the flue after leaving the boilers drops underneath the floor and crossing the building at the side of

the boiler setting, and going up again with a short connection, it reaches the round steel chimney. It seems strange that in this, as well as in some other buildings, the chimney was not located close to where the flues leave the last boiler of a series, thereby preventing much waste of heat.

Large office or commercial buildings with their cramped quarters make the designing of flues a somewhat difficult task, because of the bulkiness, and one cannot always reach the chimney by any other than long and circuitous routes; for example, in the Bowling Green Building, Fig. 3, where the gases travel nearly

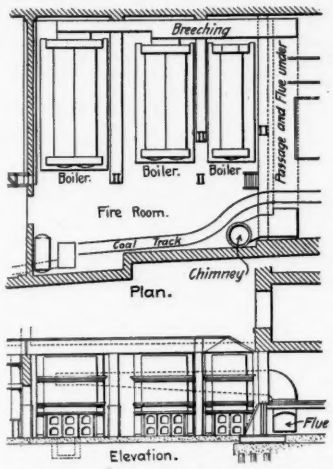


Fig. 2.—The Hudson-Building Plant.

twice the actual distance between chimney and boilers. In this plant the square brick chimney is built independent of, and outside of the main structure.

In some of the large business buildings the flues are built of sheet steel, and are laid in brick trenches, arched over with masonry; in others, the flue is entirely of brick or cement as in the Columbia University power plant, the flue of which is arched over with brick, covered and filled in at the top with a non-conductor of heat, and above that the boiler room concrete floor is laid. The brick flues in an iron works plant, coming from two boilers on either side of the chimney, enter a common base of square section divided with a diagonal partition wall 8 in. thick. This wall extending upwards enables either pair of boilers to be used with less interference to draft than if the partition was omitted.

Where flues are of metal and laid underground in masonry, ½, 9-16 or ⅝ in. steel is frequently used, and the section made oval, with the short diameter vertical. Thickness of metal is not of very great importance to the strength of round flues, No. 16 steel being frequently used for flues 3½ ft. in diameter, but heavier metal is desirable. Joints in any style of flue should be as few and far apart as consistent with good work, and the spacing of rivets just sufficient to make the joint air-tight, strength seldom entering into the problem.

Should economizers or blowers be used in the plant these notes will still be applicable. The design of smoke flues may seem a matter of minor importance, in steam plants where natural or chimney draft is used, but it is a more important factor than generally supposed by those who have not investigated boiler economy and the waste of heat in power plants.

The Westinghouse-Christensen Suit.

On Thursday, Sept. 26, Judge Lacombe, of the United States Circuit Court, Southern District of New York, handed down his decision in the suit of the Westinghouse Air-Brake Company against the Christensen Engineering Company. The motion was for preliminary injunction, on claims 2, 4 and 11 of United States patent 481,134, to G. A. Boyden, Aug. 16, 1892, for valve for air-brakes, that patent being now owned by the Westinghouse Company. The decision is:

"This patent does not stand here with such presumption of validity only as arises from its issue by the Patent Office. It was before the U. S. Supreme Court in Westinghouse Air Brake Co., 170 U. S., 537, a litigation most hotly contested and which involved a most careful examination of the state of the art. It is true that in that case the patent now in suit was not the one sued upon, but was the shield availed of by defendant therein to protect itself. Nevertheless, the decision of the Supreme Court, expressed with no uncertain sound, must be accepted here as establishing the proposition that Boyden was an independent and meritorious inventor, who solved with great ingenuity and in the simplest manner the problem of quick action. Nothing in the affidavits or prior patents shown here calls for any qualification of this proposition.

"The second claim reads:

" 'In valve mechanism for automatic air-brakes, the combination of a communication with the brake-cylinder from both the auxiliary-reservoir and train-pipe, a single valve controlling said communication, and means to retard or restrict the flow thereto of the auxiliary-reservoir air when applying the brakes in comparison with the flow thereto of train-pipe air, whereby train-pipe air at lower pressure than said auxiliary-reservoir air will pass said valve when making an emergency application of the brakes.'

"It seems quite plain that the three elements of this claim, the 'communication,' 'the single valve,' and the 'means to retard or restrict' are all present in defendants' valve. In view of the statement of variety of form of structure which is found near the close of the specification, and of the history of application in the Patent Office, it would seem that additional elements are not to be read into this claim restricting it to the precise form shown in the drawings, but that the patentee should be entitled to a fair application of the doctrine of equivalents. As de-

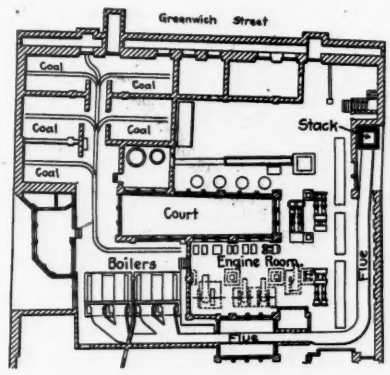


Fig. 3.—The Bowling Green Plant.

fendant's experts demonstrated when it was sought to enjoin this same valve under U. S. Patent 360,070 it is modeled upon and belongs to the group of which the valve now in suit is the exemplar; doubtless it contains improvements, but it operates by reason of its possession of the three elements above referred to; it does not present the differences in form and principle which will distinguish it from the Boyden valve, as that was distinguished from 360,070.

"There are some questions as to claims 4 and 11 which may better be reserved for final hearing, but complainants may take preliminary injunction as to claim 2.

TECHNICAL.

Manufacturing and Business.

At the annual meeting of the Thornton N. Motley Co., held at 12-14 John street, New York City, on Wednesday, Oct. 2, the following Directors were elected: Thornton N. Motley, James M. Motley, W. W. Caldwell, Wm. Moores and Newton Heston. The officers are: President, Thornton N. Motley; Vice-President and Treasurer, James M. Motley; Secretary, W. W. Caldwell.

The increasing business of the Protectus Co. has made it necessary for the President of that Company, W. C. DeArmond, to sever his connection with all other business enterprises with which he has been officially connected, in order that he can devote all his time to the management of the Protectus Co. He has, therefore, resigned as Secretary of the Pressed Steel Car Co., and as Secretary and Treasurer of the T. N. Motley Co.

The Crane Co., of New York, which is a branch of the Crane Co., of Chicago, makers of valves, fittings, pipe, etc., has recently built an addition to its plant at 497 to 505 Cherry street. The building, which is 125 ft. x 100 ft., consists of a main shop 110 ft. x 63 ft., devoted to cutting, threading and flanging large pipe, and a rear shop for the handling of small pipe and pipe bending. There are 13 pipe machines, as well as machines for screwing up flanges of all sizes and facing lathes for refacing flanges after they are screwed on. This addition is opposite the company's main warehouse and connected with its pipe storage warehouse. Being situated on the East River it makes a very convenient location, and with its modern equipment ought to be fully equal to the handling of pipe work and sketch work, of which a specialty is made.

Iron and Steel.

George M. Bard, of Muncie, Ind., Vice-President and General Superintendent of the Republic Iron & Steel Co., with headquarters in Chicago, has resigned.

J. W. Gannon has been appointed Traffic Manager for the Central Foundry Co., with office in the Morton Building, 116 Nassau street, New York, succeeding George S. Tyler, resigned.

The Cornwall Iron Company, of Cornwall, Pa., was incorporated in Pennsylvania, Sept. 26, with a capital of $600,000, by Edward C. Freeman and R. Percy Allen, of Cornwall, Isabel C. Freeman, of Washington, D. C.

James G. Lindsay and others, of Philadelphia, Pa., have organized the Eastern Steel Corporation, and will incorporate under the laws of Pennsylvania to acquire a number of steel properties and engage in making steel, iron, etc.

The total orders booked by the rail mills for 1901 delivery have aggregated 2,700,000 gross tons, including seconds, but excluding export sales. The export shipments for the first seven months were 231,000 tons, so that the year will not be less than 300,000 tons. This means that a total of over 3,000,000 tons of rails were booked, which is 650,000 tons in excess of the product of 1900, the banner year. There is no doubt that the mills will be quite unable to deliver this huge tonnage, and it is estimated that 300,000 to 400,000 tons will be carried into next year. That in itself is a pretty good start for 1902, and the delays in deliveries may have something to do with the fact that many railroads are even now placing orders for 1902, a fact otherwise difficult to explain since the price is $28.—*The Iron Age.*

New York Rapid Transit.

A site for the power house for the underground railroad has been selected by John B. McDonald, the contractor. The land selected is the block bounded by Fifty-eighth and Fifty-ninth streets and Eleventh and Twelfth avenues, and the water-front on the Hudson River, across Twelfth avenue.

Coke for Locomotive Fuel.

Some statements that coke for locomotive fuel was about to be discontinued on the Boston & Maine Railroad were recently published in the daily press, and several reasons for its disuse were given in detail. We are informed that this use of coke has not been discontinued and that there is no present intention of reverting to coal. This railroad is now using 600 tons of coke a day in local passenger service out of various cities on the line and it is considered an ideal fuel for this service. There has been no difficulty in making steam and running the several schedules. The trains are on time and, apparently, the service is appreciated by the public, particularly in the matter of greater cleanliness and freedom from smoke than is possible with coal as fuel.

Oil Burners and Air Vibration.

Some weeks ago local newspapers along those lines of the Southern Pacific Company that are using oil for locomotive fuel gave considerable attention to the annoyance of citizens by vibrations of the air caused by agitation in the fire-boxes of oil-burning locomotives. When the relative proportions of oil and air admitted to the fire-box are not exactly right there is sometimes a vibration accompanied with loud humming, which is often heard in coal-burning locomotives. The trouble that was most noticeable was on local lines in Oakland, and principally on small engines hauling local trains through one of the main streets of that city. We are informed that some little change was made in the method of admitting air, and also that a little more experience and expertness on the part of firemen has about removed the trouble.

The Long Island Tunnel.

Plans for the proposed underground railroad to be built by the Long Island Railroad Co. from Long Island to Manhattan, together with application to build the road, have been filed with the Rapid Transit Commission. The plans provide for a double tube tunnel under the East River and a double track underground road in connection therewith through Thirty-third street and up Seventh avenue to a point south of Fiftieth street, with two stations in Manhattan. The motive power is to be other than steam and the right is sought to carry freight as well as passengers. The estimated cost is $5,000,000. Work is to begin within 30 days after the franchise is granted and is to be completed within four years. President Baldwin, of Long Island, says, however, that the application for a franchise to carry freight was only made so that the road might be able to transport express and baggage if necessary.

British Exports of Locomotives and Rails.

Locomotives were exported from Great Britain in the eight months to the end of August to the value of £1,145,247, as compared with £956,590 in the corresponding period of 1900, and £912,992 in the first eight months of 1899. The exports to Australasia were more than doubled as compared with 1900, and multiplied four times as compared with 1899. The same ratios hold in exports to British South Africa. To South America there was a small increase and to British India a small decrease.

The rails exported in the first eight months of the year amounted to 300,328 tons, as compared with 247,504 tons, and 307,660 tons in the like periods of 1900 and 1899. British India was much the larger buyer, having taken 101,470 tons. Next in order are Australasia, Argentina, Sweden and Norway, British South Africa and Canada, and the latter country having taken in the eight months 28,894 tons. The value of the 300,328 tons exported in the eight months was £1,835,554. The value of 307,660 tons exported in the first eight months of 1899 was £1,473,231. Or, roughly, the prices were as $30.50 and $24.00 a ton in the two years.

Electric Interlocking at Crewe.

We published lately (p. 650) an abstract of a paper on signaling read at Glasgow by Mr. Timmis. In the discussion Mr. Webb thanked Mr. Timmis for the very complete description of what had been done at Crewe, and also for allowing the company to use his long-pull magnet in connection with the work which had been carried out. The whole of the details of the Crewe installation had been worked out by themselves. At Crewe they had lately put down some 50 miles of shunting sidings; and when the passenger station was completed he trusted there would not be a single point rod to be seen on the ground. The whole of the work would be done electrically, and they were now making a cabin to hold 300 levers to control the whole north end of the passenger station. It was now 2½ years since they

opened the first main line junction at Crewe on this system, and up to the present time it had given entire satisfaction, and caused fewer delays than any other system they had had. Since then several improvements had been made, and he believed the system was now as perfect as it could be got. This installation was quite completely described in the *Railroad Gazette*, Jan. 11, page 24.

Locomotive Orders in Belgium.

The Belgian Minister of Railroads is about to give orders for 100 new locomotives and 180 tenders. The proprietors of Belgian locomotive and car shops declare that they must discharge half their men if the State does not give liberal orders. About two years ago they were unable to fill all the State orders, and some contracts were let to foreign works.

Orders for Materials in Hungary.

The Hungarian State Railroad authorities have authorized contracts with Hungarian works for 26 express freight locomotives, 10 Mallet compound locomotives for ordinary freight and 7 for light railroads; also for 9,000 tons of heavy rails, deliveries being regulated so as to keep the works busy for some time to come.

Signal Notes.

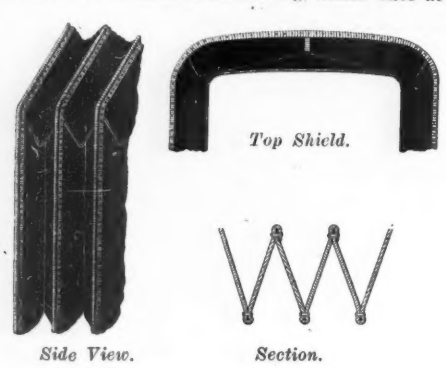
On the Boston & Albany the blades of semaphore signals are to be colored to conform to the colors in use on the New York Central; home signal arms red, distant arms yellow. Hitherto these arms (which extend to the left of the post) have been painted white on the face.

An Indiana paper says that the Pennsylvania Company has begun proceedings in court for an injunction against the Southern Indiana Railroad to compel the latter to join in the installation and maintenance of interlocking signals at the crossings of the roads of the two companies at Seymour and Elizabethtown.

On the Orleans Railroad of France there is in use an automatic train-stopping device, which ought to take the premium for simplicity. The apparatus consists of a knife which, when a fixed signal is against the train, is raised into such a position that if the engine runs past the signal a cord stretched across its frame is cut in two. This releases a spring which rings a bell. The device is the invention of Mr. Vilpon.

A Vestibule Diaphragm.

The accompanying engravings show a vestibule diaphragm called the Ajax, which is being put on the market by the E. J. Ward Co., Chicago, as an improvement over rubber diaphragms. The claims made for it are greater wearing qualities and decreased first cost. The Ajax diaphragm consists of three strips of heavy cotton material, such as is used for belting, folded once at the



Side View. *Top Shield.* *Section.*

center and riveted on the edges. In the entire diaphragm there are but two joints or laps where the intermediate section is riveted to the two outer sections. There is a shield at the top as shown for shedding water and cinders. This diaphragm is in use on a number of the larger roads, including the Chicago, Burlington & Quincy; Illinois Central; Pennsylvania; Delaware, Lackawanna & Western; Chicago & North Western, and the Chicago, Milwaukee & St. Paul. It can be used with any make of vestibule.

The Quebec Bridge.

Mr. Theodore Cooper, Consulting Engineer for the Quebec bridge over the St. Lawrence River at the city of Quebec, in his report to the annual meeting says: "The north anchorage pier is practically complete, lacking only a small part of the upper coping course. When it is remembered that this immense mass of masonry, with the suspension link projecting above it, is largely a counterweight to aid in balancing the great center span, the magnitude of the proposed bridge may be comprehended. The ground is being prepared some 200 feet north of the anchorage pier for starting the north abutment for the approach span. The most important part of the work now under construction, viz., the north channel pier, is well under way. The approach spans have had to be modified to a single span at each end, owing to the condition of the rock materials of the slopes. It is to the betterment of the general effect, for the series of short spans, which at first appeared to be demanded by economy, were not as satisfactory in appearance as one single span at each end. During the past years special studies have also been made of the main span, to improve and better the same, in advance of the preparation of the final plans."

E. A. Hoare, the Chief Engineer, reported that a contract is let to the Phœnix Bridge Co. for the two steel 210 ft. approach spans. It is intended to erect the span on the south side this fall and winter.

THE SCRAP HEAP.

Traffic Notes.

The Philadelphia Car Service Association, for the year ending Aug. 31, shows total refunds of only $6,510, which is only 8.65 per cent. of the total collections. The number of cars handled during the year by this Association was a million-and-a-half and the total collections ($75,704) were 14 per cent. above those of the preceding year, though the number of cars handled increased only 1.3 per cent., and the average detention (1.4 days) decreased a trifle.

A ticket broker of Cleveland says that the injunction proceedings on G. A. R. tickets injured the brokers of that city even more than was anticipated at the time the case was in court. He said: "People come into my place of business every day, and ask how it is that I am still open. They believe that the injunction applied to all tickets instead of being restricted to those which were sold for G. A. R. travel. When I try to explain they are still timid, and believe I am acting in defiance of the courts. I'll warrant there is not a broker in town who has not lost hundreds of dollars because of this impression."

The Great Northern has issued a notice announcing that henceforth the demurrage charge on freight cars will be $2 a day and the free time will be only 24 hours, except that shippers loading potatoes will be allowed 48 hours. These rules do not apply within the territory of the St. Paul Association. The usual demurrage rate on the Great Northern is, we believe, $1 a day, and this increase has been made, presumably, for the purpose of economizing time during the season when grain and other shipments are heavy. The regulations for loading grain are very strict, and agents have to keep a careful record of the applications made by prospective shippers for empty cars. Cars are distributed in proportion to the average daily shipment of grain from the several stations, and agents at first assign one car to each applicant, afterwards assigning others in proportion to the amount of grain offered by each and awaiting shipment. All unfilled orders for cars expire at 6 o'clock Saturday night and the orders must then be renewed.

A Trust in the Mediterranean.

The convenient but very inaccurate word "trust" seems likely to be adopted even in the French. We learn now that there is a "trust des frets en Méditerranée." It appears that the merchants of certain towns in Algeria are alarmed by the immoderate demands of the "syndicated companies." These syndicated companies include two or three steamship companies, also the Paris, Lyons & Mediterranean Railroad.

Fast Runs.

On the night of Sept. 22 the Lake Shore Limited train, No. 19, made a great run between Albany and Syracuse. It left Albany 51 minutes late with seven Pullman cars and made the run of 148 miles in 2 hours and 44 minutes, 1 minute better than the schedule time of the Empire State Express, which has five cars that are lighter than those of the Limited. The run from Utica, 53 miles, was made in 54 minutes. The train was hauled by one of the Central Atlantic type engines, No. 2,997, run by Engineer Edward Lyons.—*Syracuse Post-Standard, Sept. 25.*

On Sept. 23 the westbound mail train on the Lake Shore & Michigan Southern, No. 15, made a fast run between Toledo and Elkhart. The train was an hour and 50 minutes behind its schedule. The lighter engines used between Cleveland and Toledo made what improvement on the schedule they could until Toledo was reached, and then a larger engine was attached to the seven cars and a fast run was begun for Elkhart. Between Toledo and Elkhart, a distance of 133 miles, 50 minutes was made up, the run being made in 2 hours and 20 minutes. Taking out the water stops, every mile was made in less than a minute. West of Elkhart another spurt was taken, and the fast mail arrived in Chicago almost on its schedule, being near enough on time to make western connections.—*Exchange.*

The *Four Track News* says that on Aug. 13 the Saratoga Limited of the New York Central was run from Troy to New York, 149 miles, in 158 minutes. This train is similar to the Empire State Express. From Rensselaer to Yonkers, 127 miles, the time was 123 minutes, equal to 62 miles an hour; Barrytown to Hyde Park, 15.44 miles, 12 minutes; rate 77.2.

Havana Floating Dry Dock.

The Secretary of the Navy has authorized the repairs recommended by Naval Constructor Gillmour to the floating steel dry dock recently bought from Spain. Mr. Gillmour estimated that $66,000 would be required to put the dock in perfect condition if an extra dock force was employed. It is probable that the regular force can be used and the total cost considerably reduced. The dock will be thoroughly cleaned and painted, the electrical machinery will be repaired, and new suction pipes for the air pumps will be provided to insure a freer flow of water. It is probable that the dock will be sent to the new naval station at Olongapo, Philippines.

Improving Rivers in China.

Commissioner Rockhill sends from Pekin a note addressed by the Dean of the Diplomatic Corps to the Chinese plenipotentiaries, asking the financial co-operation of their Governments in improving the Peiho and Whangpoo Rivers and their acceptance of regulations concerning the Whangpoo River conservancy board.

The representatives of the powers, in consenting to the raising to 5 per cent. effective of the present tariff on maritime imports, have decided to ask of China as a compensation to participate financially in the improvement of the courses of the Peiho and the Whangpoo. As regards the Peiho, the works for improvement, commenced in 1898, have recently been resumed by an international committee in which the Chinese Government will be able to be represented as soon as the administration of Tientsin shall have been handed over to it. The representatives of the powers have only to request the Chinese Government to pledge itself to pay annually to the said commission a sum of 60,000 haikwan taels (tael = 71.7 cents) for the maintenance of the works. As regards the Whangpoo, a conservancy board, charged with the direction and control of the works, is to be created. This board shall consist of members representing the interests of the Chinese Government, and those of the foreigners engaged in the shipping trade of Shanghai. The expenses entailed by the works and the general management of the undertaking are estimated at the sum of 460,000 taels during the first twenty years. This sum shall be supplied in equal portions by the Chinese Government and foreign interests.

The Growth of the Locomotive.

"While Stephenson's 'Rocket' had a capacity of 15 h.p., many recent locomotives can develop 1,000 and some even 1,500-h. p. The capacity of an organism which has increased scarcely ten-fold in weight has been raised 100-fold." This striking comparison is the introductory sentence of an article on "Innovations in Locomotive Construction," by W. Berdrow, in the Journal of the German Railroad Union.

The Jungfrau Railroad.

The Jungfrau Railroad is not dead yet, though little has been heard of it recently. The section of it which is in tunnel is now constructed for more than a mile to a point 9,156 ft. above the sea. About 1⅛ miles more of tunnel will bring it to the "Ice Sea," 1,308 ft. higher. The engineer thinks that it may be well to make the upper terminus for the present at the "Jungfraujock," about 1½ miles further, where a line of sleighs may safely ply over the Aletsch glacier to the Rhone valley at a point only 6 miles distant from the northern entrance of the Simplon Tunnel (Brieg). Above the "Jock" the construction would be more costly and the number of passengers doubtless much smaller than on the lower sections.

The Metropolitan Express Company.

This company, which, for several weeks, has been doing a parcel express business by means of special cars on the street railroad lines of Manhattan and the district north of the island, now has stations in Mt. Vernon, Yonkers and New Rochelle, and within a few weeks will open a number of additional stations in New York City and in the suburbs, the final plans contemplating offices at Yonkers, Mt. Vernon, Hastings, Irvington, Tarrytown, Kingsbridge, Tremont, Fordham, White Plains, Mamaroneck, Larchmont, New Rochelle, Pelham, Williamsbridge and Bedford Park. There will be city stations at Bayard street and the Bowery, Fiftieth street and Third avenue, 129th street and Lexington avenue, 129th street and Amsterdam avenue, and in Forty-second street, opposite the Grand Central Station. The preparation of these stations has been delayed by the difficulty of constructing underground trolley connections. The company now has in service eight cars, but has ordered 20 more. These new cars will be 37 ft. long. They will be fitted to connect with either underground or overhead trolley wires and will also have a small storage battery to furnish power on the short branches running from the street railroad lines into the principal stations. At each station the company has wagons for use in collecting and delivering goods, and thus far 60 wagons have been put in service. Most of these are drawn by horses, but eventually it is intended to use electric vehicles mostly.

The running time of the cars between Manhattan and Mt. Vernon, about 14 miles, is two hours. Marketmen in the suburban cities, who buy their supplies of fresh vegetables in New York, are now able to take advantage of the markets at a later hour in the morning than was formerly possible. An officer of the company says that thus far the charges for carrying goods have been based on the tariffs in force on the lines of the older suburban express companies.

The Metropolitan Express Company is controlled by the owners of the New York Electric Vehicle Transportation Company, which runs electric automobiles in Manhattan. This company is enlarging its business and expects, within a few months, to have 400 automobiles running in the city. By the use of the "oxide" storage battery the company has greatly reduced the expense of the power for running automobiles, and most of the carriages are now capable of running 50 miles with one charge. The new batteries, which have been in use several months, prove to be far more durable than anything before used, and some of them have been run 3,000 miles without showing deterioration.

LOCOMOTIVE BUILDING.

The Chilian State Railways are receiving bids for eight locomotives.

The Alabama & Vicksburg is having two engines built by the Baldwin Locomotive Works.

The United Railways of Havana are reported to have ordered four locomotives from the Baldwin Locomotive Works.

The Hokkaido-Tanko (Japan) is having five engines built at the Schenectady works of the American Locomotive Co.

The Cape Government Railroad of South Africa has placed an order with the American Locomotive Co. for 14 engines.

The American Machinery & Export Co., 122 Liberty street, New York, is in the market for 25 consolidation locomotives for South America.

The Chicago Great Western is having 41 engines built by the American Locomotive Co. This includes the order for 20 noted in our issue of July 19.

The Vandalia has placed an order with the American Locomotive Co. for 10 engines. It is reported that this road has also ordered five engines from the Baldwin Locomotive Works.

CAR BUILDING.

The Cape Breton is having 100 flat cars built by Rhodes, Curry & Co.

The Pullman Co. is building 10 cars for general service.

The Chicago, Milwaukee & St. Paul is having four coaches built by the Pullman Co.

The Chilian State Railways are having 100 freight cars built by Baume & Marpent.

The American Steel & Wire Co. is having 50 freight cars built by the Pressed Steel Car Co.

The Loyalton Lumber Co. is having 10 freight cars built by the California Car Works.

The Waycross Air Line is having one freight car built by the Youngstown Car & Mfg. Co.

The Escanaba & Lake Superior is having 40 freight cars built by the Russell Wheel & Foundry Co.

The St. Louis, Kansas City & Colorado is having one coach built by the American Car & Foundry Co.

The Vandalia is reported to have ordered 200 coal cars from the American Car & Foundry Co. It is also rumored that this road will soon receive bids for 16 passenger coaches, five combination smoking and baggage cars and four express cars.

The St. Louis & San Francisco has ordered from the American Car & Foundry Co. 50 wooden flat cars of 80,000 lbs. capacity for October delivery. They will weigh 27,500 lbs., will be 34 ft. 5 in. long, 8 ft. 9 in. wide and will be equipped with Bethlehem steel axles, Trojan couplers, American continuous draft rigging,

Scott springs, American Steel Foundry Co.'s cast-steel bolsters.

The Pittsburgh, Shawmut & Northern, as noted in a recent issue, has ordered 300 cars from the American Car & Foundry Co. The road has also ordered 200 from the Erie Car Works. These are for November delivery. They are double hopper coal cars of 70,000 lbs. capacity and will be equipped with Simplex bolsters, Westinghouse brakes, Tower couplers and McKeen draft rigging.

BRIDGE BUILDING.

BRYSON CITY, N. C.—We are told that the county is considering a 100-ft. bridge over Deep Creek near this place. R. H. Clarke, County Clerk.

GLENS FALLS, N. Y.—The State Canal Board has granted permission to the Greenwich & Johnsonville to build a bridge over the Champlain Canal in the town of Northumberland.

INDIANAPOLIS, IND.—Bids are wanted, Oct. 7, for bridges over Bakers and Dry Branches; also for the substructure and superstructure of a bridge across Indian Creek. Apply to Harry Smith, County Auditor.

JASPER, IND.—Bids are wanted by the County Commissioners, until Oct. 8, according to report, for a steel bridge.

KNOX, IND.—Bids are reported wanted Oct. 7, for a bridge across Robbing ditch. Christian Borchardt, Chairman County Commissioners.

LAWRENCEBURG, IND.—Bids, with plans and specifications are wanted, Oct. 7, by the County Auditor, for a bridge over Hogan Creek, near Weisburg.

LOWELL, MASS.—G. H. Bickford, Designing Engineer, Salem, Mass., has made plans for a bridge over Merrimac River, at Pawtucket Falls, for which preliminary work has only been done. The bridge will consist of about four stone arches, the total length being 367 ft., and cost about $150,000.

LUMBERVILLE, PA.—A new iron bridge will be built across the Pannaucussing Creek at this place in Bucks County.

MANKATO, KAN.—Bids are wanted, according to report, with plans, etc., Oct. 7, for stone arches over Plum Creek; the other over Disappointment Creek.

MENDOTA, MO.—Bids are wanted, Oct. 7, by George W. Dickson, at Yuma, Mo., for a steel bridge.

MURPHYSBORO, ILL.—The Jackson County Board of Supervisors and the Highway Commissioners at a meeting held Sept. 24 authorized a steel bridge across the Big Muddy River at the intersection of Murphysboro, Carbondale, DeSoto and Somerset townships. The bridge and approaches will cover 215 ft.

PERRYVILLE, MD.—According to report, plans are being made for a double-track bridge for the Philadelphia, Wilmington & Baltimore over the Susquehanna River.

PETERBOROUGH, ONTARIO.—The Minister of Railways and Canals is considering the proposition of building a steel bridge over the Trent River at Heeley Falls.

POWDERLY, TEXAS.—Bids are wanted at once by William Marchbanks, Commissioner, Paris, Texas, for a steel bridge over Pine Creek. W. G. Thompson, County Surveyor, Powderly.

PUEBLO, COLO.—A bridge at Mesa avenue, according to report, is under consideration.

READING, PA.—A stock company is endeavoring to secure permission to build a toll bridge over the Schuylkill River at Sixth street. The citizens are opposed to the plan and are petitioning for a free bridge over the river at that point. Thomas P. Merritt is Chairman of the Board of Trade Committee which is pushing this matter.

The County Commissioners have ordered new bridges built over the Swatara River, near Mt. Aetna. The County Controller will open bids for this work on Oct. 14.

REFUGIO, TEXAS.—Bonds to the amount of $5,000 will be issued for building a bridge over the Blanco River. Address the County Clerk.

ROSWELL, N. MEX.—The Commissioners of Chaves County want bids, until Oct. 7, for a 400 ft. steel bridge three miles east of this place.

ST. THOMAS, ONTARIO.—A new steel bridge with concrete abutments will be built over Dingman's Creek in the Township of Westminster. Plans are at the office of James A. Bell, C. E., this place.

SALINAS, CAL.—Bids are wanted, until Oct. 8, by J. D. Kaler, County Clerk, for a bridge over Peach Creek.

SPARROW LAKE, ONTARIO.—The Ontario Government is petitioned to make a grant towards building a bridge over the Severn River at this place.

WASHINGTON, D. C.—The Board of Army Engineers, appointed to prepare plans for the new highway bridge across the Potomac River, has resumed its meetings at the office of Col. C. J. Allen, President of the Board, at Twentieth and I streets N. W.

Bids are wanted, Oct. 12, at the office of the Commissioners, District of Columbia, for the foundations of a masonry bridge over Rock Creek on the line of Connecticut avenue extended. Lansing H. Beach, Commissioner.

WESTMORELAND, KAN.—Bids are wanted, Oct. 7, for a steel bridge over Cedar Creek in Blue Township. H. P. Scritchfield, County Clerk.

Other Structures.

PITTSBURGH, PA.—It is reported that the American Bridge Co. has secured an option on 40 acres of land at West Homestead, as a site for a large structural and bridge plant. The land fronts on the Monongahela River, and the Pennsylvania, Pittsburgh & Lake Erie and the Baltimore & Ohio Railroads pass through the property.

SHEFFIELD, ALA.—According to report Superintendent Hutchens, of the Southern Ry., says that the shops of that company will be removed from Memphis, Tenn., to Sheffield, Ala., where work has already been begun on the new buildings.

ST. LOUIS, MO.—The letting of contracts aggregating about $11,000,000 for construction work on the buildings and grounds of the Louisiana Purchase Exposition will begin Dec. 1. About $7,000,000 will be spent on buildings, and about $4,000,000 on the grounds. The letting will begin with the contracts for four big exhibit buildings which, with their surroundings, will cost about $4,000,000. Each entire building will be let to one contractor who will sublet the different work on that building. The designs for the separate buildings assigned to the individual members of the Commission of Architects will be submitted in scale drawings by the middle of October, and the working drawings of the main buildings to be let first, will be ready by Nov. 1. This work will be in direct charge of Mr. Isaac S. Taylor, of St. Louis, who is Chairman of the Commission of Architects, and Director of Construction and Maintenance for the Louisiana Purchase Exposition.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvii.)

Engineers' Club of Philadelphia.

At the regular meeting of the Club, on Saturday, Oct. 5, at 8 p.m., an illustrated paper on "Some Unusual Locomotives," will be read by A. B. Eddowes.

American Society of Civil Engineers.

At the meeting on Oct. 2 there was a regular business meeting and a paper entitled "Mechanical Installation in the Modern Office Building," by Charles G. Darrach, M. Am. Soc. C. E., was presented for discussion. This paper was printed in the August number of Proceedings.

New England Railroad Club.

The next meeting of the New England Railroad Club will be held at Pierce Hall, Copley Square, Boston, Mass., Tuesday evening, Oct. 8. Mr. C. N. Woodward, Superintendent of the Midland Division of the New York, New Haven & Hartford R. R., will read a paper on "Train Despatching."

Rocky Mountain Railway Club.

At the meeting, held April 20, in Denver, Colo., the following officers were elected: President, C. H. Quereau, Assistant Superintendent Machinery Denver & Rio Grande; First Vice-President, G. W. Rhodes, Assistant General Superintendent Burlington & Missouri River R. R.; Second Vice-President, Charles Dyer, General Superintendent Colorado & Southern. Mr. J. W. Gilluly, Treasurer of the Denver & Rio Grande Railroad, was elected to the position of Treasurer of this club.

Western Society of Engineers.

At a regular meeting of the Western Society of Engineers, Monadnock Block, Chicago, Oct. 2, Mr. J. V. Schafer, of the Link-Belt Machinery Co., presented a paper on "Washing Bituminous Coals by the Luhrig Process." The Chicago, Burlington & Quincy will furnish the Society a special train for an excursion over its lines in Northern Illinois on Saturday, Oct. 5. The train will leave the Union Station at 9:15 a.m., and stop at points of interest. The route will be through Aurora and Ottawa to Streeter, then through LaSalle and Spring Valley to Zearing, and from Zearing, returning on the main line, through Aurora to Chicago, arriving about 6 p.m.

Railway Signaling Club.

The annual meeting of this Club will be held in the Audience Hall of the New York state building (Elm Wood entrance, Pan-American Exposition), Buffalo, on Oct. 8 and 9, from 9:30 a.m. to 1:30 p.m. each day. Officers will be chosen for the coming year and two papers will be presented and discussed: Compensation and Crank Motion, by C. A. Christofferson (Chicago Great Western), and Maintenance of Automatic Electric Block Signals, by H. S. Balliet (Lehigh Valley). These papers will be found on another page.

The Club has received an invitation from the Lehigh Valley to take a trip to Batavia and inspect the disk and semaphore automatic signals, and also to go by the L. V. to Niagara Falls. Invitations have also been received to visit the shops of the Taylor Signal Co., in Buffalo, and of the Union Switch & Signal Co., at Swissvale, after the meeting. Definite announcements will be made on the 8th, as to when the trip will be taken over the Lehigh Valley.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. T. G. Shaughnessy, President of the Canadian Pacific Railway, has been made a Knight Bachelor of the Order of St. Michael and St. George by King Edward.

—Mr. Charles H. Hix, the new Superintendent of the First Division of the Seaboard Air Line, is 39 years of age. He began his railroad career as a check clerk in the agent's office at Saltville, Va., for the Norfolk & Western, and spent the following 20 years in various capacities, going from clerk to operator, to agent, to train despatcher, to chief train despatcher and trainmaster. In July of last year he went with the Seaboard Air Line as trainmaster of the Second Division, later being transferred to the First Division, and, on Sept. 15, this year, he became Superintendent of the same Division at Raleigh, N. C.

—Mr. Robert Gould, Locomotive, Carriage and Wagon Superintendent of the Great Southern Railway of Buenos Ayres, has recently arrived in New York and will spend two or three weeks in this country, going as far west as Chicago. He is particularly interested in locomotives, in shops for building and repairing cars and in tools and shop equipment and methods generally. Our readers may remember the abstract of a paper by Mr. Gould on the use of compound locomotives on the Buenos Ayres Great Southern, which was read before the Engineering Congress at Glasgow, and which appeared by abstract in the *Railroad Gazette*, page 646.

—Mr. Maurice S. Connors, General Superintendent of the Toledo & Ohio Central, was born June 7, 1858, at Toronto, Ont., and entered railroad service in 1872 as a water boy on the Lake Shore & Michigan Southern, later becoming a telegraph operator. For two years (1881-83) he was train despatcher of the Evansville & Terre Haute, and for four years following held a similar position on the Cincinnati, Hamilton & Dayton. In 1887 he became Master of Transportation and in 1889 Superintendent of the Cincinnati and Indianapolis Division of the same company. Then for eight months, in 1890, he was General Superintendent of the Peoria & Pekin Union, and, in December, 1891, he became Superintendent of the Hocking Valley & Ohio River Division of the Columbus, Hocking Valley & Toledo. In March, 1899, he was made General Superintendent of the Hocking Valley, successor to the Columbus, Hocking Valley & Toledo. Mr. Connors assumed his new duties on Sept. 10, of this year.

—Mr. F. D. Casanave, lately General Superintendent of Motive Power of the Pennsylvania Railroad, went to the Baltimore & Ohio on Oct. 1 as General Superintendent of Motive Power, succeeding Mr. J. N. Barr (Mechanical Superintendent), who has gone to the Erie. Mr. Casanave has been at Altoona as General Superintendent of Motive Power since March 15, 1893. Before that he was Superintendent of Motive Power of the Pennsylvania Lines, Northwest System, at Fort Wayne for six years, having already served at the same place for six years as Master Mechanic. In fact, Mr. Casanave has spent his life with the Pennsylvania System. He began in 1862 as an apprentice at Altoona and for 39 years has been in the mechanical department of the Pennsylvania. Mr. Casanave's qualities as a man, an engineer and a railroad officer are too well known to make it necessary for us to say a word about him. For years he has stood in the first rank in his department of railroading. He was born in France, Dec. 24, 1844.

—Mr. E. H. McHenry, Chief Engineer of the Northern Pacific Railroad, resigned from the service of that company on Sept. 1, as was announced in our issue of Sept. 6. He will shortly sail from Tacoma on a trip to the Far East. Mr. McHenry has within a few years risen to an important place in his profession. He was born in Cincinnati, Ohio, Jan. 25, 1859, of American parents, his father having been a native of South Carolina and his mother from Tennessee. He took a scientific course at the Pennsylvania Military Academy at Chester, Pa., now the Pennsylvania Military College, leaving at the end of the academic year of 1876. Later he received from the college the degree of Master of Engineering. He entered the service of the Northern Pacific Railroad in the spring of 1883 and served with that company in various subordinate engineering positions for a number of years, having been engaged on explorations, surveys, construction and in office work. During the hard times following 1883 he did a good deal of miscellaneous engineering work, largely in town engineering. In the spring of 1885 he got his first residency on the James River Valley Railway, which had been bought and was completed by the Northern Pacific. Then for a short time he was with the Minnesota & Northwestern, and in the spring of 1886 went back again to the Northern Pacific, and has been continuously in the service of that company, until his resignation on Sept. 1 of this year. There he has passed through all the grades from chainman up to Chief Engineer and was one of the Receivers of the company before its reorganization in 1896. Many of the lines of the company have been built under his immediate or general charge, including the James River, the Butte, the Coeur de'Alene, the Milner extension, Souris River line, the Bitter Route extension, Washington Central extension, etc. In fact, there are about 30 of these lines, all branches of the Northern Pacific. He was in direct charge of the building of the Stampede tunnel through the Cascade Range, completing the first all-rail connection of the Northern Pacific to the coast over its own rails. This tunnel is 9,844 ft. long. He rectified the Bismarck pier (Missouri River bridge), weighing 4,500 tons, by building a new foundation under the sliding pier and moving the pier back to place, 44 in., on steel roller bearings. Under Mr. McHenry's administration 80 lineal miles of timber trestles have been replaced by steel and masonry bridges and embankments. A very valuable part of his work has been the series of studies that he has carried on, together with Mr. J. W. Kendrick, for grade reductions over the greater part of the Northern Pacific and for revision of the motive power of the company, having in mind the most economical mutual adaptation of motive power and grades. In this field his work has been original, and it is to be hoped that he will some time write a systematic account of it. The result of the work of Mr. McHenry and Mr. Kendrick on the efficiency of the Northern Pacific as a machine for transportation we have often referred to, and only regret that we have never seen a way to present it in any completeness to the railroad and engineering world.

ELECTIONS AND APPOINTMENTS.

Ann Arbor.—G. R. Burt, Treasurer and Purchasing Agent, will also assume the duties of Secretary, succeeding D. C. Tate.

Baltimore & Ohio.—F. D. Casanave, heretofore General Superintendent of Motive Power of the Pennsylvania R. R., has been appointed General Superintendent of Motive Power of the B. & O., the Cleveland Terminal & Valley and the Pittsburgh & Western, succeeding J. N. Barr, Mechanical Superintendent, resigned, effective Oct. 1. C. E. Burr has been appointed Superintendent of Police, succeeding H. B. McMaster, Special Agent, resigned.

J. H. Glover, Superintendent of the Pittsburgh Division, with headquarters at Connellsville, Pa., has resigned, and the duties of that office will, until further notice, be discharged by J. F. Irwin, Trainmaster at Connellsville.

Blackwell, Enid & Southwestern.—S. Dunn, heretofore Assistant Division Superintendent of the Louisville & Nashville, has been appointed Vice-President and General Manager of the B., E. & S. W.

Boston & Maine.—C. H. Wiggin has been appointed Assistant Superintendent of Motive Power, succeeding

P. M. Hammett, resigned. D. E. Davis becomes Master Mechanic of the Concord & White Mountains Divisions, succeeding Mr. Wiggin, and C. B. Smith, in turn, succeeds Mr. Davis as Master Mechanic of Boston shop, effective Oct. 1.

Central of Georgia.—W. E. Estes has been appointed Assistant General Freight Agent.

Chicago, Milwaukee & St. Paul.—At a meeting of the directors, held recently, H. H. Rogers was elected a director, succeeding the late A. Van Santvoord.

Cleveland Terminal & Valley.—See Baltimore & Ohio.

Columbus, Sandusky & Hocking.—M. J. Caples has been appointed Engineer Maintenance of Way, with headquarters at Columbus, Ohio.

Georgia Southern & Florida.—W. F. Buchanan has been appointed Auditor, with headquarters at Macon, Ga., succeeding A. F. Sherwood, deceased.

Houston & Texas Central.—A. N. Leitnaker has been appointed Division Superintendent.

Kansas Southwestern.—E. A. Austin, heretofore Trainmaster of the Atchison, Topeka & Santa Fe., has been appointed Acting Superintendent of the K. S. W.

Maine Central.—Philip M. Hammett, heretofore Assistant Superintendent of Motive Power of the Boston & Maine, has been appointed Superintendent of Motive Power of the M. C., succeeding Amos Pilsbury. Mr. Pilsbury will be assigned to special duties, effective Oct. 1.

Marietta, Columbus & Cleveland.—J. C. Riddell has been appointed General Superintendent, with headquarters at Marietta, Ohio, succeeding J. K. Macdonald.

Pennsylvania.—Wallace W. Atterbury, now Superintendent of Motive Power of the Pennsylvania Railroad Division of the Pennsylvania Railroad, has succeeded F. D. Casanave as General Superintendent of Motive Power of the Pennsylvania Railroad Lines East of Pittsburgh & Erie, at Altoona. Richard N. Durborow, now Superintendent of Motive Power of the Buffalo & Allegheny Valley Division, is made Superintendent of Motive Power of the Pennsylvania Railroad Division, and Herbert M. Carson Superintendent of Motive Power of the Buffalo & Allegheny Valley Division. All of these appointments took effect Oct. 1.

Pere Marquette.—S. A. Chamberlain has been appointed Acting Master Mechanic, with headquarters at Ionia, Mich., succeeding W. T. Rupert, resigned.

Pittsburgh & Western.—See Baltimore & Ohio.

Shreveport & Red River Valley.—C. A. DeHaven has been appointed Superintendent of Motive Power, succeeding W. R. Howdon, Master Mechanic, resigned.

Southern Pacific.—The resignation of Charles M. Hays, President, took effect on Oct. 1, and E. H. Harriman will assume the duties, temporarily. J. Kruttschnitt will, in addition to his duties as Fourth Vice-President and General Manager, become Assistant to the President.

Vera Cruz & Pacific.—W. Brummer has been appointed Manager.

West Virginia Northern.—Owing to the death of J. M. Templeton, General Manager, Henry Hanst, General Freight and Passenger Agent, has assumed the duties of General Manager, with the title of Acting General Manager.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alabama Roads.—It is said that a subscription of $10,000 is being raised by the citizens of Blue Spring, Ala., to aid in building a railroad from Blue Spring to Louisville, Ala., 10 miles.

Arkansas & Choctaw.—Grading is reported begun on the extension from Arkinda, Ark., to Wichita Falls, Texas, 226 miles. Contracts have been sublet by the Choctaw Construction Co., for about 190 miles of this line. (Aug. 16, p. 582.)

Bruce Mines & Algoma.—The plans of this company for their line from Bruce Mines to Rock Lake, Ont., 16¼ miles, have been approved by the Department of Public Works at Ottawa. (Aug. 2, p. 554.)

Carolina & Northwestern.—In regard to the 12 miles of new construction reported last week, an officer writes that the same is change of location from the 52¼ mile mark to a point about a mile north of the present depot at Lincolnton, in order to reach a number of cotton mills which are now without railroad facilities. The contracts for the grading have been let to Bacheler & McGruder, of Lincolnton, N. C., and to Sam Dunovant for the masonry. The maximum grades are 1½ per cent.; maximum curve, 10 deg. Securities already issued for change of gage will cover the expenses of the work. (Sept. 20, p. 660.)

Chambersburg, Greencastle & Waynesboro (Electric).—The detailed route of this company, for which surveys have recently been made, are as follows: Beginning in Chambersburg, along what is known as the Greencastle Mud Road to Guilford Springs, Marion and Greencastle; thence along the Greencastle & Waynesboro Turnpike to Shady Grove, Zullinger, Waynesboro and Waynesboro; thence to Rouzerville and Pen Mar. An extension is also planned from Rouzerville to nearby towns. The capital stock of this company is $120,000. The chief office is at Chambersburg and the directors are as follows: A. N. Pomeroy, Dr. David Maclay, Wm. L. Minnick, Alexander Stewart, Chambersburg, Pa.; D. M. Good, J. J. Oller, Waynesboro, Pa.; E. A. Tennis, C. H. Latta, Philadelphia, Pa.; J. P. Ranhauser, Greencastle, Pa.

Colorado & Gulf.—Preliminary surveys are reported for this projected line from Clifton, Ariz., to Durango, Colo., by way of Frisco, Alma and Defiance, Ariz., along the San Juan River, thence across to the Las Animas River and up that river to Durango. Thomas H. Wigglesworth is Chief Engineer. (Aug. 2, p. 554.)

Denver & Rio Grande.—It is said that a branch 10 miles long will be built from West Cliff, Colo., to the Bassich gold mine in Cutler County, and known as the Texas Creek Branch. The mine is owned by J. P. Morgan and other capitalists, and it is thought the new line will be in operation by Jan. 1.

Fish River.—This company was incorporated in Maine, Sept. 23, to build from Ashland, on the Bangor & Aroostook, to Fort Kent, on the St. John River, about 50 miles. The officers are as follows: President, Franklin W. Cram, Bangor; Treasurer, Edward Stetson; Clerk, Frederick H. Appleton.

Florida Roads.—A company has been incorporated in Florida, to build a road from Puntarassa, on the Gulf, northeast across Florida to Fort Pierce, which is on the East Coast R. R., about 60 miles north of Palm Beach. The route proposed involves some very difficult construction on account of the swamps encountered, but the country through which the line is to pass is very rich in places. The line is graded north of Lake Okeechobee through Fort Bassenger. John M. Roach, of the Chicago Union Traction Co., and M. B. Hereley, also of Chicago, are interested. The proposed route will be at least 140 miles long. The company's offices are to be located on Useppa Island, which is the winter residence of Mr. Roach, and structures for the use of the company are now being erected.

Great Northern.—It seems to be definitely decided that the Cascade Division is to be equipped with electric motors instead of steam locomotives. It is said that the electric improvement will be applied first to that portion of the line which extends from Leavenworth, on the east side of the mountains, to Skykomish, on the west side, a distance of 66 miles, and if the equipment proves successful, it will be at once extended.

Harrisburg & Lewisberry (Electric).—The detailed plans of this company, incorporated Aug. 14, and recently chartered to build in Pennsylvania, are as follows: The proposed route commences in New Cumberland County and runs thence to Front street in the borough of Lewisberry, York County; thence to a point near Silver Lake, in York County, returning by same route. The capital stock is $42,000. The motive power is to be electricity and the directors are as follows: Jacob H. Foreman (President), Harry Hertzler, Chester C. Bashon, E. E. Lemton, H. W. Smith, Carlisle, Pa.; R. N. Stonesifer, W. A. Parks, Lewisberry, Pa. (Sept. 27, p. 676.)

Long Island.—President Baldwin states that 100-lb. rails are to be laid on the Montauk Division between Long Island City and Valley Stream, 17 miles distant. He adds that continued changes are to be made which will in a few years make the Long Island into a first-class railroad in all respects.

Louisville & Nashville.—Surveys have been begun for a line about six miles long, from a point near Compton, Ala., to new coal fields in Blount County.

Manitoulin & North Shore.—The Department of Public Works at Ottawa have approved the plan for this company's route for a distance of 18 miles southeast from Sudbury, Ont. (Sept. 27, p. 676.)

Mexican Anthracite Coal & Mining.—It is said that this company will build a railroad 32 miles long, from Hermosillo, Mexico, to anthracite coal lands in the San Marcial Valley, Sonora, Mexico. The General Manager of the company is J. T. Clarke, of Pennsylvania.

Mexico & Magdalena.—This company has been incorporated in New Jersey to build steam or electric railroads, telephone and telegraph lines within the Republic of Mexico. The capital stock is $400,000, and the incorporators are: Francis H. Hill, George A. Treadwell, Walter S. Logan, Charles M. Demond and Charles S. Daley, all of New York.

Michigan Central.—It is said that a second track is to be laid between Ridgetown and Bismarck, Ont., 18 miles.

Minneapolis, St. Paul & Sault Ste. Marie.—Surveys are reported completed for an extension from Nahma, Delta County, 25 miles north and west, up the Sturgeon River. It is said that the road will be built by the Sturgeon River Lumber Co., which is to operate a large sawmill at its terminus.

New York, New Haven & Hartford.—Contract has been let to John J. O'Brien, of New York, for straightening the line on the Naugatuck Division, at the end of the single track just above Baldwin's Station, to Bridge street in Ansonia, and for double tracking the same. The work involves the construction of 15,000 yards of masonry and will cost about $500,000.

Niobrara, Missouri River & Western.—This company was incorporated, Sept. 20, in New Jersey, with a capital stock of $300,000, and proposes to build in the counties of Knox and Boyd, in Nebraska, and then along the Missouri River through Gregory, Tripp, Lyman and Stanley counties in South Dakota in a northwesterly direction. It is said in the articles of incorporation that the motive power is to be both steam and electricity. The route proposed is considerably over 200 miles long. The incorporators are: E. A. Houston, George L. Adams, Vac Randa, Niobrara, Neb.; John R. Kaucher, Reading, Pa.; William S. Lambert, Philadelphia, Pa.

Pan-American.—The concessions for this proposed line in Mexico have been granted to J. M. Neeland, and permit the construction of a railroad from San Geronimo, in the State of Oaxaca, Mexico, at about kilometer 260, on the National Tehuantepec, along the coast to the frontier of Guatemala south of Tapachula, the coffee center. The road will be about 310 miles long, following in general the range of the Sierra Madre mountains and lying between those mountains and the coast, and a branch is proposed to Tuxtla Gutierrez, which is the capital of the State of Chiapas. The officers of this company are as follows: President, Walter Everett; Vice-President, Franklin Everett; Second Vice-President, E. B. Everett; Treasurer, Fremont Everett; General Manager, J. M. Neeland. (July 12, p. 508.)

San Pedro, Los Angeles & Salt Lake.—The contracts for grading the first 30 miles out of Los Angeles as far as Pomona, has been let to F. M. Monroe and G. O. Monroe, of Monrovia, and work is to be begun at once. (Sept. 13, p. 644.)

Seaboard Air Line.—It is said that the entire system of this road is to be rock ballasted, a project which will cost in the neighborhood of $5,000,000, and involves 2,000 miles of road. At present the base of operations is to be Henderson, N. C., where a large rock crushing plant has been located.

Shreveport & Red River Valley.—An officer writes in regard to the branch from Winnfield, La., 28 miles, that the line has not yet been located. (Sept. 20, p. 660.)

Toronto, Hamilton & Buffalo.—There is a report that this company will build from Brantford, 27 miles west to Woodstock, Ont., to a connection with the Canadian Pacific.

Villa Rica Branch.—This company has been organized to build about three miles of railroad in Georgia, to reach mines in Carroll County. It will connect with the Southern. J. S. B. Thompson and Albert Howell, Jr., are interested.

Wisconsin Roads.—Work is reported begun on the logging road being built by the Peshtigo Lumber Co., from Bagley Junction, 12 miles northwest through timber lands. (May 3, p. 308.)

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—For the two months ending Aug. 31, 1901, the gross earnings of this company were $9,704,572, as opposed to $7,950,890 for the same period last year, an increase of $1,753,681. This, however, is on an average mileage of 7,835, as against 7,803 last year, an addition of 31 miles. The operating expenses for the two months this year were $5,642,045, an increase of $539,961 over the expenses for the same period last year. The income from operation for July and August, 1901, after the deduction of taxes and rentals from net earnings was $3,722,209, as against $2,520,593 last year, an increase of $1,201,616.

Chicago, Indianapolis & Louisville.—Additional 5 per cent. refunding bonds of 1947, to the extent of $300,000, have been listed by the New York Stock Exchange. The purpose of these bonds is to provide for permanent improvements, new equipment, etc., and they bring the total amount issued up to $3,842,000.

Dunkirk, Allegheny Valley & Pittsburgh.—This road, now operated as a division of the New York Central & Hudson River, is to pass under the operating control of the Lake Shore some time this month. It will probably be made a part of the Eastern Division of the latter and operated separately. The D., A. V. & P. is a line southwest from Dunkirk, Pa., to Titusville, 90 miles long.

Great Northern.—A deed has been filed transferring the Great Falls & Canada to this property for a consideration of $750,000. It is also agreed that the Great Northern shall widen the road to standard gage by Oct. 30, 1902. The line joins the Alberta road near Sweetgrass Station. This latter road is being changed to broad gage as far north as Lethbridge, which is the point of junction with the Canadian Pacific.

Kansas City & Northern Connecting.—An offer has been made to the Secretary of the Bondholders' Committee to take up all the bonds under control of the Committee at 37 per cent. of the principal amount net to bondholders, confirmed by the Guaranty Trust Co., of New York. A majority of the bonds under control of the Committee have already agreed to this proposition. The judicial sale is set for Oct. 11, and it is thought that John W. Gates, of Chicago, is the proposed purchaser. It is also thought that he will obtain control of the through line from Quincy, Ill., to Kansas City, 250 miles, by means of a combination of the above road with the Quincy, Omaha & Kansas City and the Missouri, Kansas City & Eastern. These last two are bankrupt properties which he can control at will. The Quincy, Omaha & Kansas City extends from West Quincy to Trenton, Mo., 133 miles. The Omaha, Kansas City & Eastern extends from Trenton to Pattonsburg, 36 miles, and the Kansas City & Northern Connecting extends the remaining distance between Pattonsburg and Kansas City, 81 miles.

Lexington & Eastern.—The $1,000,000 issue of first mortgage bonds, dated 1895, and payable last January, was not paid, and the following plan has been arranged for reorganization of the company without foreclosure. If a majority of those interested agree to this plan, the managers will proceed without foreclosure:

1. In that event so many of the new outstanding first mortgage bonds as the managers may consider proper shall be extended without change in the rate of interest and without affecting the mortgage to July 1, 1911; but the company shall have the right at its option to redeem, at any time after Dec. 31, 1901, all or so many of said bonds as it desires to redeem at a rate not exceeding 102 and interest, the bonds when not procurable for less than this price to be drawn by lot, if necessary. All such bonds when purchased shall be retired and canceled and general mortgage bonds for equal amounts may be issued in lieu thereof at the request of the company. The managers reserve the right, however, to cause to be paid off at par and interest so many of the now outstanding first mortgage bonds as in their judgment can safely be paid by the appropriation of any money in the company's treasury.

2. The holders of the $1,500,000 general mortgage bonds shall waive all interest on their bonds up to Aug. 1, 1901. They shall be entitled to interest thereafter, payable on the first days of February and August, at the following rates, viz.: 2 per cent. from Aug 1, 1901, to Aug. 1, 1906; 3 per cent. from Aug. 1, 1906, to Aug. 1, 1911; 5 per cent. from Aug. 1, 1911, to Feb. 1, 1935, the date of maturity of the said bonds.

In consideration of such waiver the holders of general mortgage bonds shall receive the company's deferred debentures for the difference between 5 per cent. (payable by the terms of the bonds) and the amount of interest accruing after Aug. 1, 1901, as above provided. The said debentures shall be payable without interest at such times as the company may itself decide, but they shall become immediately due and payable in case any dividend is declared upon the company's stock. At the option of the company the said debentures, when paid, may be paid either in cash or in general mortgage bonds carrying the then maturing instalment of interest.

Under the foregoing provisions the holder of each $1,000 general mortgage bond will be entitled to debenture scrip as follows, viz.: On every interest day from Feb. 1, 1907, to Aug. 1, 1911, both inclusive, to scrip for $10.

3. The stock will not be affected by the proposed readjustment if carried out without foreclosure, but in order to secure authority to enter into the proposed agreements, deposits of such amounts of stock as the managers may deem adequate for the purpose will be required as essential prerequisites to carrying out this plan.

The Lexington & Eastern extends from Lexington to Jackson, Ky., 93 miles.

North Pacific Coast R. R.—It is said that this line running from Sausalito to Cazadero, Cal., 92 miles, is to be absorbed by the Southern Pacific.

Seaboard Air Line.—The property of the Birmingham Belt R. R., which consists of a line around the city, has been sold for $500,000, to H. M. Atkinson and associates, and it is thought that the purchase is in the interest of the Seaboard Air Line.

Southern.—The report for the months of July and August show gross earnings of $5,952,399, as opposed to $5,526,704 for the same period last year, an increase of $425,695. After deducting expenses and taxes there remain for the two months in 1901 $1,662,485 net earnings, as against $1,547,889 for the same period last year, an increase of $114,596. The percentage of expenses to earnings this year was 72.7; last year it was 71.99.

Washington & Potomac.—This property has been transferred to the Washington, Potomac & Chesapeake for a consideration of $100,000, and a deed to that effect has recently been filed at Washington, D. C.